NAVSHIPS 0965-101-0010

Technical Manual

for

SOUND RECORDER-REPRODUCER RD-365/UN

DEPARTMENT OF THE NAVY
NAVAL SHIP SYSTEMS COMMAND

NAVSHIPS 0965-101-0010

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for

SOUND RECORDER-REPRODUCER RD-365/UN

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DEPARTMENT OF THE NAVY
NAVAL SHIP SYSTEMS COMMAND

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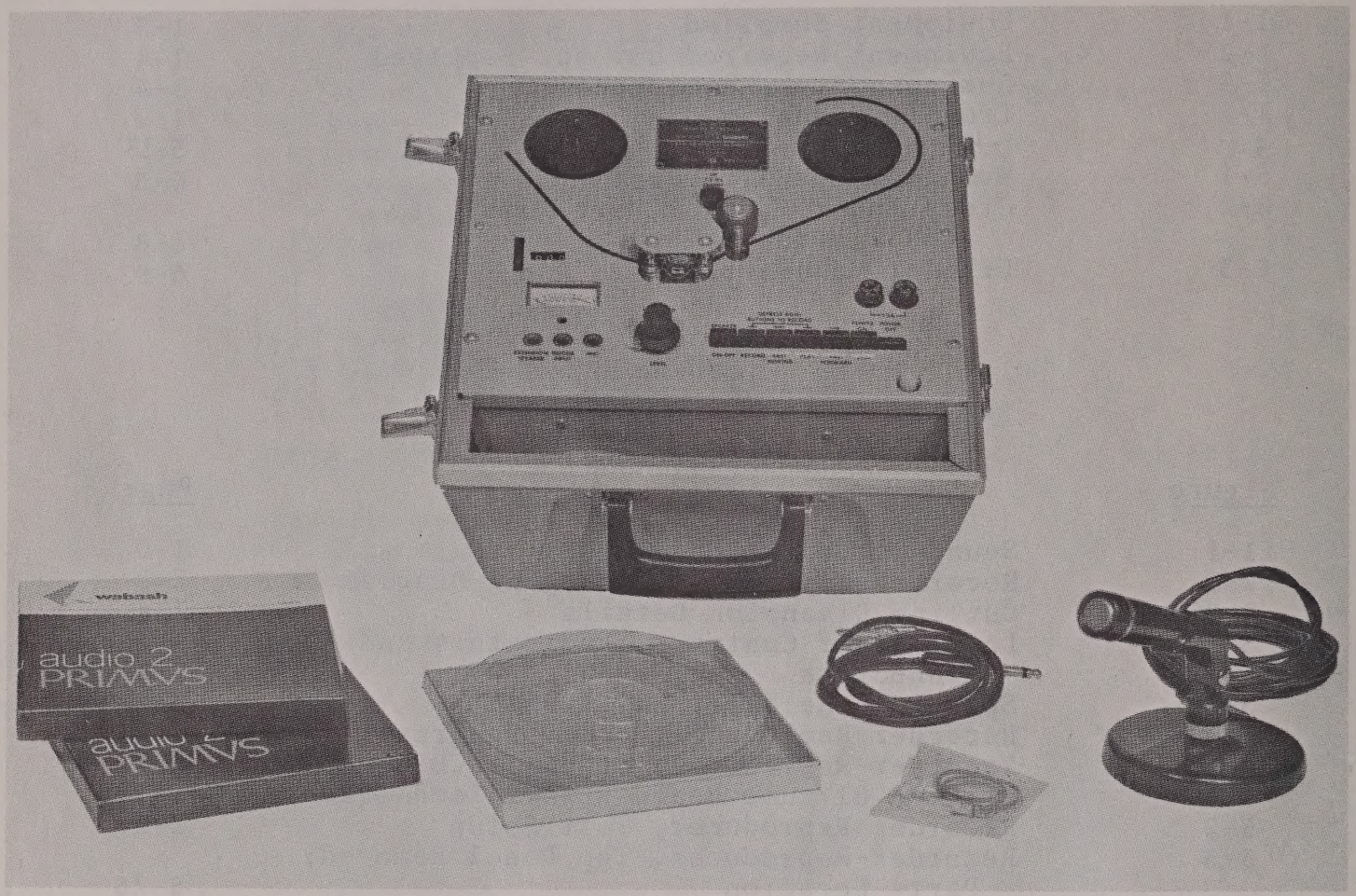


Figure 1-1. Sound Recorder-Reproducer RD-365/UN (Cover Removed)

SECTION 1

GENERAL INFORMATION

1-1. INTRODUCTION.

This technical manual covers the theory, operation, and maintenance of Sound Recorder-Reproducer RD-365/UN . (figure 1-1).

1-2. PURPOSE AND USE.

Sound Recorder-Reproducer RD-365/UN (hereafter referred to as the recorder) is an all transistorized portable tape recorder-player designed for entertainment as well as instructional purposes. It is used to magnetically record sound on iron oxide coated plastic recording tape. Sound recordings may be made using a microphone, or by recording audio directly from a telephone line, phonograph, radio or motion picture equipment. Reproduction is provided by a self contained amplifier and speaker. Any portion of the tape may be repeatedly played back in whole or in part, or the tape may be stored as a permanent record. The tape can be played back immediately without further processing. When recorded information is no longer desirable, the recorder will automatically erase the old information as a new recording is made. The old information can also be erased without recording any new information on the tape. The recorder can be used with slide (or film strip), or motion picture narration by using the microphone input to record the narration, or by using a pre-recorded tape that has been specially prepared for slide or motion picture film. An external speaker jack is provided for use of external speakers to allow a larger audience area coverage.

1-3. FACTORY OR FIELD CHANGES.

No factory or field changes have been made to the equipment to the date of publication of this manual. Reference should be made to the Electronics and Maintenance Book (EIMB), NAVSHIPS 0967-000-0100 for

complete field change index to verify that field changes have or have not been made since this issue of the manual was published.

1-4. QUICK REFERENCE DATA.

a. Nomenclature.....Sound Recorder-Reproducer RD- 365/UN

b. Contract Number.....N00126-69-C-1649

c. Cognizant Inspection agency....DCASR, Chicago

d. Contractor.....Ren Industries, Inc.
3940 West 63rd Street
Chicago, Illinois 60629

e. Number of packages per complete shipment.....1

f. Total cubical content...Packaged: 3150 cubic inches
Unpackaged:1406 cubic inches

g. Total weight.....Packaged: 28 lbs.
Unpackaged:24 lbs.

h. Power requirements.....115V ±10%, 50 or 60 Hz, single phase

i. Power demand (maximum).....68 watts

j. Input level
Mic.....1 mv nominal
Bridging.....200 mv nominal

k. Output power.....2 watts

l. Frequency response.....7.5 i.p.s.: 100 to 7500 Hz
3.5 i.p.s.: 100 to 5000 Hz

1-5. EQUIPMENT DESCRIPTION.

The recorder and its accessories are housed in a high impact plastic carrying case. Accessories supplied include: a microphone, a bridging input accessory cord, and one 7-inch empty tape reel. The carrying case has a hinged top cover which is removable during operation. The tape transport and amplifier circuitry are mounted on a steel chassis and aluminum panel assembly which mounts in the carrying case. All operating controls and a record level indicator (VU meter) are mounted on the top panel of the chassis. Push-button controls

(switches) are used for simplicity of operation. Functional names of controls and a tape threading diagram are marked on the top panel of the chassis. Input and output jacks are also located on the top panel. The chassis is easily removed from the carrying case to facilitate servicing.

1-6. EQUIPMENT SUPPLIED.

Table 1-1 lists the equipment supplied for Sound Recorder-Reproducer RD-365/UN .

TABLE 1-1. EQUIPMENT SUPPLIED

Qty Per Equip	Nomenclature		Dimensions (in.)			Volume (Cu Ft)	Weight (LB)
	Name	Designation	Height	Width	Depth		
1	Sound Recorder Reproducer	RD-365/UN	7-1/4	14-1/2	13-1/4	1406	24
1	Microphone (and cord)		120 inches long (min)				
1	Reel (empty)		7 in. dia				
2	Reels of tape		7 in. dia each contains 1200 ft of tape				
1	Technical Manual	NAVSHIPS 0965-101-0010					
1	Attachment cord		5 feet long				

1-7. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

Table 1-2 lists the equipment required but not supplied for operation and maintenance of Sound Recorder-Reproducer RD-365/UN .

TABLE 1-2. EQUIPMENT REQUIRED BUT NOT SUPPLIED

Qty Per Equip	Nomenclature		Required Use	Equipment Characteristics
	Name	Designation		
2	AC VTVM	AN/USM-143	Trouble-shooting and Maintenance procedures	General purpose ac vtvm
1	Signal Generator	AN/URM-127	Trouble-shooting and Maintenance procedures	Frequency: 100 to 7500 Hz Voltage: 1 mv to 10V
1	Distortion Analyzer	HO 332A	Trouble-shooting and Maintenance procedures	
1	Flutter Meter	CDEF-FL-3D-1		
1	Multimeter	AN/USM-311		
1	Oscilloscope	AN/USM117C		
1	Variac	Powerstat 116B		
1	Stopwatch			
1	Alignment Tape	3.75 ips, 120 usec Curve Ampex No. 01-31331-01	Play equalization adjustment	
1	Alignment Tape	7.5 ips, NAB Ampex No. 01-31321-01	Play equalization adjustment	

1-8. SEMICONDUCTOR COMPLEMENT.

Table 1-3 lists the transistor and diode complement for Sound Recorder-Reproducer RD-365/UN.

TABLE 1-3. SEMICONDUCTOR COMPLEMENT

Ref Desig	Type	Function
CR1	1N34A	VU meter rectifier
CR2	1N34A	Same as CR1

TABLE 1-3. SEMICONDUCTOR COMPLEMENT (Cont)

Ref Desig	Type	Function
CR3	1N3253	Part of driver signal coupling and bias network
CR4	1N645	Same as CR3
CR5	1N3253	Same as CR3
Q1	2N2925	Microphone preamplifier
Q2	2N2925	Same as Q1
Q3	2N2712	VU meter amplifier
Q4	2N2712	Record driver amplifier
Q5	2N2925	Playback preamplifier
Q6	2N2925	Same as Q5
Q7	2N4401	Playback audio driver input amplifier
Q8	2N4402	Playback audio driver amplifier
Q9	2N4919	Playback audio output amplifier
Q10	2N4400	Playback audio driver amplifier
Q11	2N4922	Playback audio output amplifier
Q12	2N4922	Power supply series regulator
Q13	2N3053	Bias oscillator
Q14	2N3053	Same as Q13
VR1	1N972B	Reference regulator for Q12

1-9. RUNNING SPARES.

Running spares supplied with each recorder-reproducer consists of five spare fuses, two spare lamps, and one spare capstan drive belt.

SECTION 2

INSTALLATION

2-1. UNPACKING AND HANDLING (fig. 2-1).

a. UNPACKING. The tape recorder is packed in double cardboard containers for domestic shipment. The inner container is placed in a plastic bag for moisture proofing and then placed in the outer container. Cardboard spacers are used to fill space around the equipment to reduce shock and movement during transport. Two reels of recording tape (1800 feet each) and one empty take-up reel are packaged in separate containers and are included in the inner container. No special procedures need be followed for unpacking the equipment. Care should be observed to prevent damage to the equipment during unpacking.

b. INSPECTION OF EQUIPMENT. Inspect the equipment for any apparent damage that may have occurred during shipment. If damage is found, report the damage immediately in accordance with established procedures. Check the equipment received against the packing slip and the list of equipment supplied (table 1-1) to determine that all required equipment was received.

2-2. POWER REQUIREMENTS.

The recorder operates from a 115V ac, 50 or 60 Hz power source. The line frequency of the power source must be determined to be either a nominal 50 Hz or 60 Hz, since the capstan drive pulley is selected according to the power source frequency.

2-3. INSTALLATION.

The recorder is portable and requires only a relatively flat surface area within eight feet of the ac power source (refer to fig. 2-2).

2-4. CAPSTAN DRIVE PULLEY SELECTION AND INSTALLATION.

The recorder is supplied with the capstan drive pulley for a 60 Hz source installed on the capstan drive motor shaft. If the

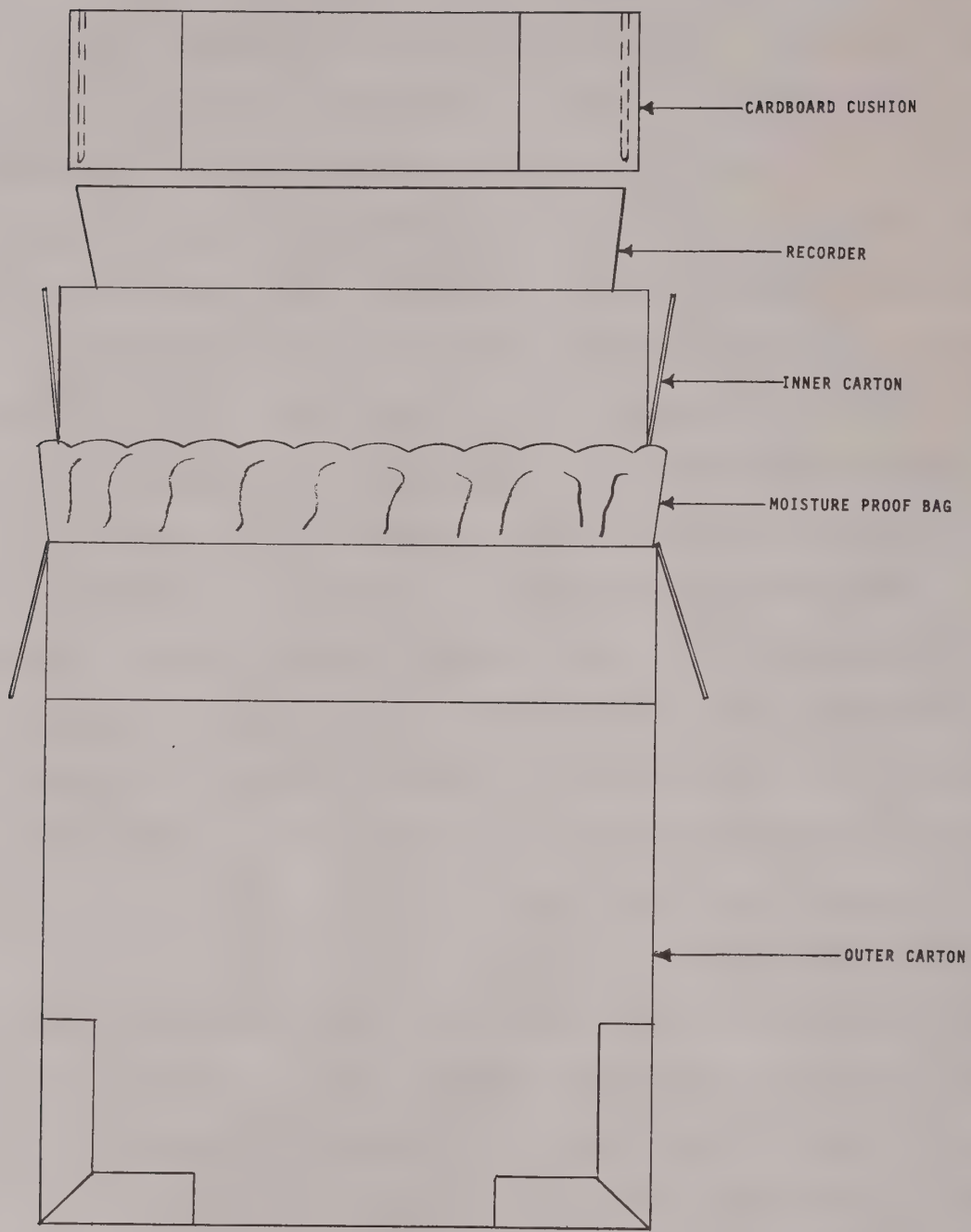


Figure 2-1. Recorder-Reproducer Packaging Diagram

frequency of the power source available is 50 Hz, the 50 Hz capstan drive pulley must be installed. The 50 Hz drive pulley is mounted (for storage) on the bottom of the chassis on the tape transport assembly (figure 5-4). The procedure for replacing the capstan drive pulley is as follows:

a. Remove the chassis from the carrying case in accordance with paragraph 4-3.

b. Remove the fan blade from the capstan drive motor by loosening two setscrews and pulling the fan blade from the motor shaft. Pull capstan drive belt off capstan drive pulley.

c. Remove the capstan drive pulley by loosening one setscrew and pulling the pulley off the motor shaft.

d. Remove the replacement capstan drive pulley (for 50 or 60 Hz as required) from its storage shaft by removing one nut and flat washer (figure 5-4) and pulling the pulley off the storage shaft.

e. Install the capstan drive pulley (removed in step c) on the storage shaft and secure it using the flat washer and nut removed in step d.

f. Install the replacement capstan drive pulley on the capstan drive motor shaft in approximately the same position as the one removed in step c and tighten the setscrews.

g. Place the capstan drive belt in the groove on the pulley and replace the fan blade on the motor shaft and tighten the setscrews.

h. Replace the chassis in the carrying case.

2-5. PREPARATION FOR RESHIPMENT.

Preparation of the equipment for reshipment consists of cleaning the equipment and packaging it. Remove any dust, grease, or other foreign material from the top panel, storage compartment, and case. Fold the power cord and place it in the storage compartment. Wrap

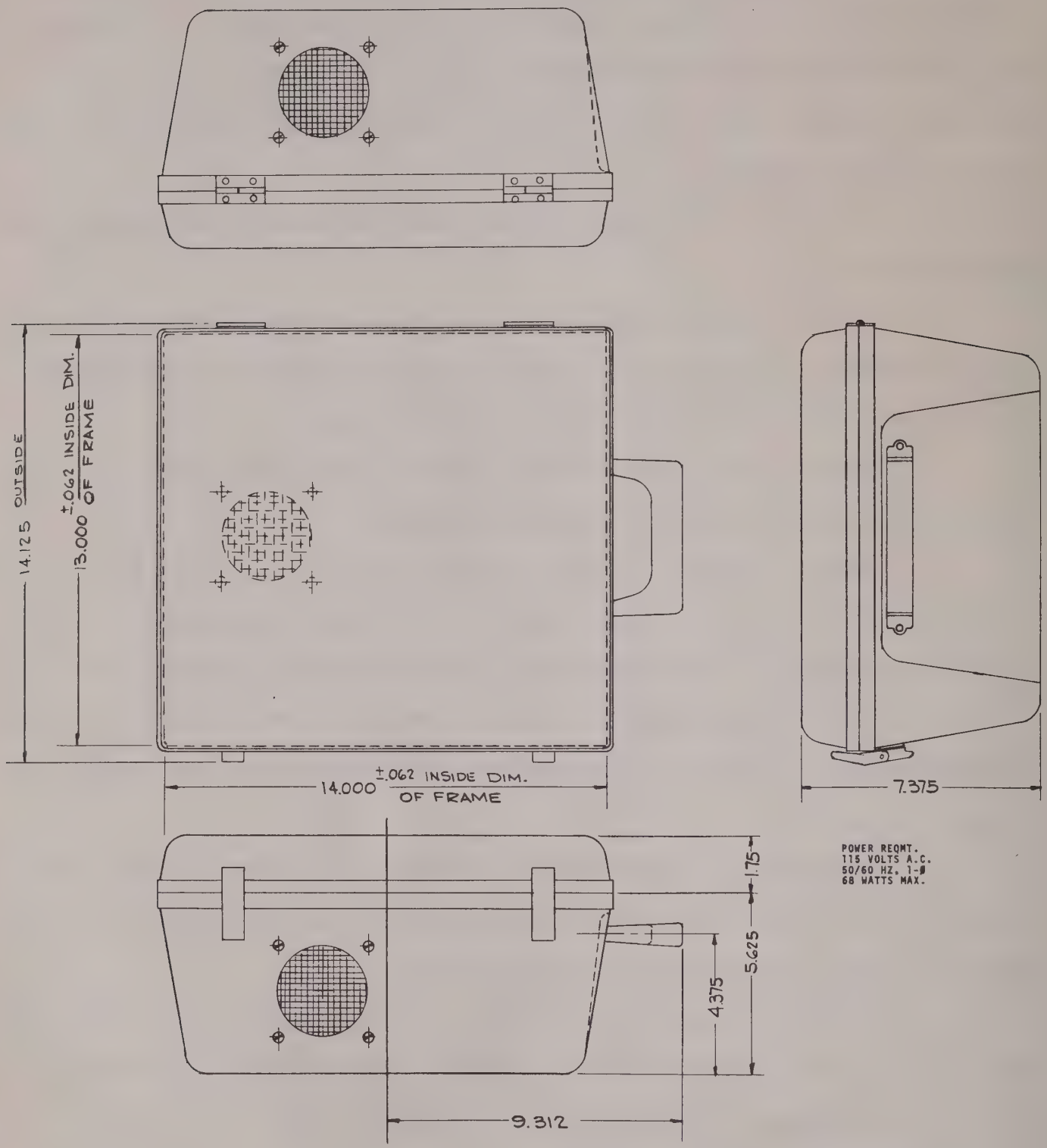


Figure 2-2. Outline Dimension Details

the microphone and attachment cord in protective material (such as kimpack) and place them in the storage compartment. Make sure that the equipment and accessories are clean and in serviceable condition. Install the top cover on the carrying case and secure the latches. To pack the equipment, place the recorder in the original shipping cartons (if available) or in similar manner to that described in paragraph 2-1.

2-6. STORAGE.

For temporary storage, place the microphone and attachment cord in the storage compartment with the power cord and close the top cover. For long term storage, the recorder should be placed in a waterproof (plastic) bag and placed in a protective container, such as a cardboard carton.

SECTION 3

OPERATION

3-1. INTRODUCTION.

This section outlines operating procedures to be followed in the use of the recorder. These procedures assume that the equipment is in normal operating condition. The correction of irregularities in operation, or of equipment failure, should be attempted only by qualified maintenance personnel.

3-2. OPERATING CONTROLS, INDICATORS, AND CONNECTORS.

All operating controls and indicators are located on the top panel (figure 3-1).

a. SPEED CONTROL. The Speed control selects the record or play speed of the tape transport. When the control is in the raised (up) position the speed selected is 7.5 inches-per-second (i.p.s.); the lower (down) position selects 3.75 i.p.s.

b. POWER OFF. POWER OFF control S1 removes primary power from the recorder power supply.

c. POWER ON-STOP. POWER ON-STOP control S2 performs two functions: (1) applies primary power when the POWER OFF control is engaged, and (2) sets the tape transport to the stop condition.

d. FAST FORWARD. FAST FORWARD switch S3 applies power to the fast forward drive motor to drive the tape in a forward direction at a fast rate.

e. PLAY. PLAY switch S4 selects the playback mode of operation.

f. FAST REWIND. FAST REWIND switch S5 applies power to the fast rewind drive motor to drive the tape in a reverse (rewind) direction at a fast rate.

g. RECORD. RECORD switch S6 is used in conjunction with the PLAY switch to select the record mode of operation. The RECORD and

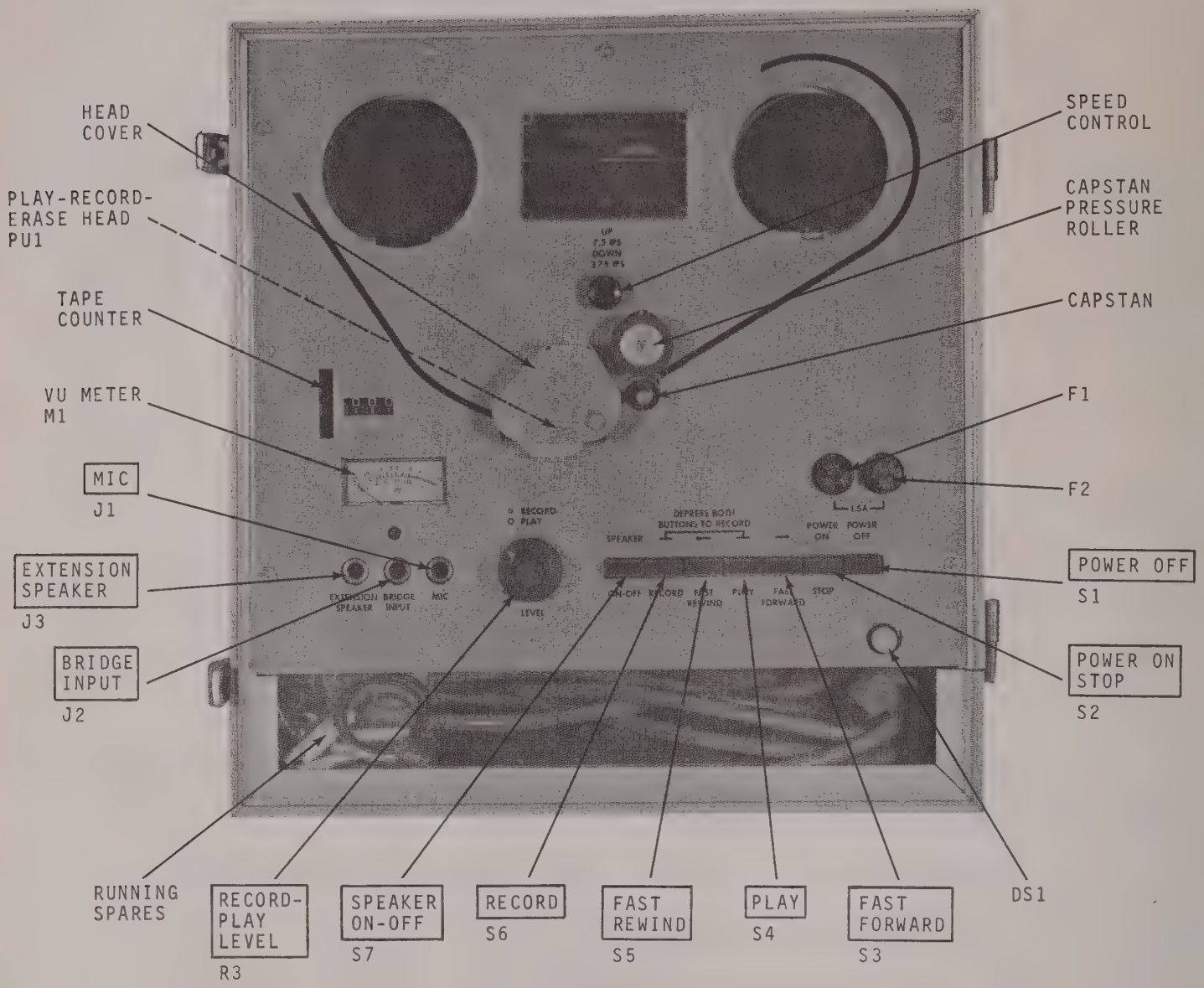


Figure 3-1. Location of Controls, Indicators and Connectors

PLAY switches must be depressed simultaneously to achieve the record mode.

h. SPEAKER ON-OFF. SPEAKER ON-OFF switch S7 turns the internal speaker on or off.

i. RECORD LEVEL. RECORD LEVEL control R3A adjusts the level at which sound is recorded on the tape. The RECORD LEVEL control is normally set for a peak reading of zero on the VU meter while talking into the microphone to set the proper record level.

j. PLAY LEVEL. PLAY LEVEL control R3B adjusts the volume in the playback mode of operation.

k. VU METER. VU meter M1 indicates the record level (in Volume Units) in the record mode.

l. TAPE COUNTER. Tape counter MP6 indicates the number of turns of the tape reels during operation. A knurled thumbwheel is accessible on the top panel for resetting the counter to zero.

m. MIC CONNECTOR J1. Provides microphone input connection to the record circuits.

n. BRIDGE INPUT CONNECTOR J2. Provides bridging audio input connection from external source (such as a radio) to the record circuits. An attachment cord is supplied for use with the bridging input.

o. EXTENSION SPEAKER CONNECTOR J3. Provides connection for an external speaker and opens the internal speaker leads when external speaker is used.

3-3. PREPARATION FOR USE.

Since this equipment is portable, the operator or user prepares the equipment for use. To prepare the equipment for use, place the recorder on a flat surface within eight feet of a 115V ac power source. Disengage the two luggage catches and raise the hinged top cover to

the 90 degree position, slide it to the rear to separate the separable hinges, and remove the top cover. Remove the microphone and attachment cord from the storage compartment and uncoil the power cord.

a. Plug the power cord into a 115V ac outlet.

NOTE

The frequency of the ac power source must be either 50 Hz or 60 Hz. Two capstan drive pulleys are supplied with the recorder, one for the 50 Hz and one for 60 Hz. In these operating procedures it is assumed that the correct capstan drive pulley has been installed (paragraph 2-4) by maintenance personnel.

b. Depress the POWER ON-STOP switch and note that the power on indicator lamp lights. If the lamp does not light, check fuses F1 and F2. If necessary, replace fuses with same type and rating.

c. Place a full reel of tape on the feed (left) reel pedestal.

d. Place an empty reel on the takeup (right) reel pedestal.

e. Unwind approximately 18 inches of tape. If end of tape is secured on the reel with an adhesive, cut this portion off to prevent the possibility of adhesive getting on the head or capstan.

f. Route the tape (as indicated by black line on the top panel) over the tape guide stud and face of recorder-reproducer-erase head, between the capstan and capstan pressure roller, and onto the hub slot on the empty takeup reel. Wind three or four turns onto the takeup reel.

g. Set the speed control to the desired recording speed. Press the speed control to the down position for 3-3/4 inches per second (i.p.s.) or pull the speed control to the up position for 7-1/2 i.p.s.

NOTE

The slow speed (3-3/4 i.p.s.) is normally used for voice recording (such as conferences, etc.) and the fast speed (7-1/2 i.p.s.) is normally used for recording music since it provides better fidelity at high frequencies.

h. Set the tape counter to 000 using the knurled thumbwheel.

3-4. OPERATING PROCEDURES.

The recorder has two modes of operation, the record mode and the playback mode. In the record mode, the sound input may be applied using the microphone for "live" input, or from an external sound source (radio, etc.) using the bridge input jack and attachment cord. In the playback mode, the internal speaker may be used or an external speaker connected to the EXTERNAL SPEAKER jack may be used.

a. RECORD OPERATION.

(1) Prepare the recorder for use as described in paragraph

(2) Connect the microphone to the MIC jack, or an external audio source (such as a radio, etc.) to BRIDGE INPUT jack using the attachment cord.

(3) Depress RECORD switch and speak into the microphone or apply audio from external source, and set the RECORD LEVEL control for "peak" readings of zero on the VU meter. This sets the record amplifier circuits to the proper recording level.

(4) Depress the stop switch.

(5) To start recording, depress the RECORD and PLAY switches simultaneously.

(6) Periodically check the record level as indicated on the VU meter. Peak readings should occur at approximately 0 VU on the

scale.

(7) To use the tape counter, write the tape counter indication number on the tape carton at the beginning and end of each recording session, selection, or topic being recorded. Refer to these numbers for playback or if additional recordings are to be made on the same tape. Starting additional recordings at a higher number than the end of the last recording on the tape will insure that previous recordings will not be erased or destroyed.

(8) When recording is finished, depress the STOP switch.

(9) If another recording is to be made on the same tape, advance the tape a small amount by depressing the FAST FORWARD switch. This will provide a clear break between recordings. If no further recording is to be made, rewind the tape on the feed reel by depressing the FAST REWIND switch.

(10) To deenergize the recorder, depress the POWER OFF switch.

b. PLAY OPERATION.

(1) Prepare the recorder for use as described in paragraph 3-3, using pre-recorded tape on the feed reel pedestal. If an external speaker or headset is to be used, plug the speaker or headset plug into the EXTENSION SPEAKER jack.

(2) Depress the PLAY switch.

(3) Adjust the PLAY LEVEL control for a comfortable listening level.

(4) If a selected portion of the tape is to be played, depress the STOP switch, then depress the FAST FORWARD switch and allow the tape to advance until the number on the tape counter corresponds to the number on the tape carton for the beginning of that portion and depress the STOP switch. Depress the PLAY switch to

start playback.

(5) After the desired portion has been played (or the end of the tape), depress the STOP switch, then depress the REWIND switch until all of the tape is rewound on the feed reel. Depress the STOP SWITCH.

(6) To deenergize the recorder, depress the POWER OFF switch.

c. SOUND SYSTEM OPERATION. Sound system operation is the same as play operation except that the pre-recorded tape is specially prepared to narrate slides, film strips, or motion pictures. Audible signals are usually pre-recorded as a cue for slide or film strip advancement in educational aids.

3-5. OPERATORS MAINTENANCE.

Operators maintenance consists of keeping the equipment clean, and, when required, splicing and editing tape.

a. CLEANING. It is important to keep equipment clean. Dirt and foreign matter not only detracts from the appearance, but can deteriorate operation of the equipment. This is particularly true in tape recording equipment where a buildup of foreign matter on the record-reproduce head can cause poor recording and playback.

Three very important areas to keep clean are: (1) the record-reproduce-erase head, (2) the capstan, and (3) the capstan pressure roller. Use a clean, lint-free cloth moistened with an approved Navy solvent (trichlorthane, etc.) to clean the record-reproduce-erase head, capstan, and capstan pressure roller. Clean all surfaces using a clean lint-free cloth and soap and water.

b. SPLICING AND EDITING. If the tape is accidentally torn or broken, the tape may be repaired by splicing the ends together. Sections of tape may be removed or inserted and different tapes may

be joined together by splicing the ends with splicing tape. Using the following procedure will insure a strong splice and prevent fraying or damage to the tape, or poor operation of the equipment. Refer to figure 3-2 and splice tape as follows:

1 Overlap the broken ends of the tape (1) or the portion to be spliced, cut the ends of the tape diagonally at a 45 degree angle (2).

2 Butt the ends of the tape (3) together smoothly without overlap and place a short piece of splicing tape over the joint on the glossy side of the tape.

CAUTION

Do not use cellophane tape or any tape not recommended for splicing. Use of common types of adhesives may damage the recording tape or the surface over which it must pass. The sticky material will bleed or leak through the connecting point and cause adjacent layers of tape to stick to the parts of the recorder. Use recommended splicing tape only. Improperly spliced tape or the use of improper splicing tape may also result in faulty operation of the recorder.

3 Trim the edges of the splice (4) to remove any sticky surface. The section of tape should be undercut so the spliced section is slightly narrower than the tape (5).

3-6. HANDLING PRECAUTIONS.

Certain precautionary measures should be used when rewinding and storing the tape to preserve and prolong the life of magnetic tape, and maintain the quality of recordings.

Store the tape in separate containers, preferably in metallic

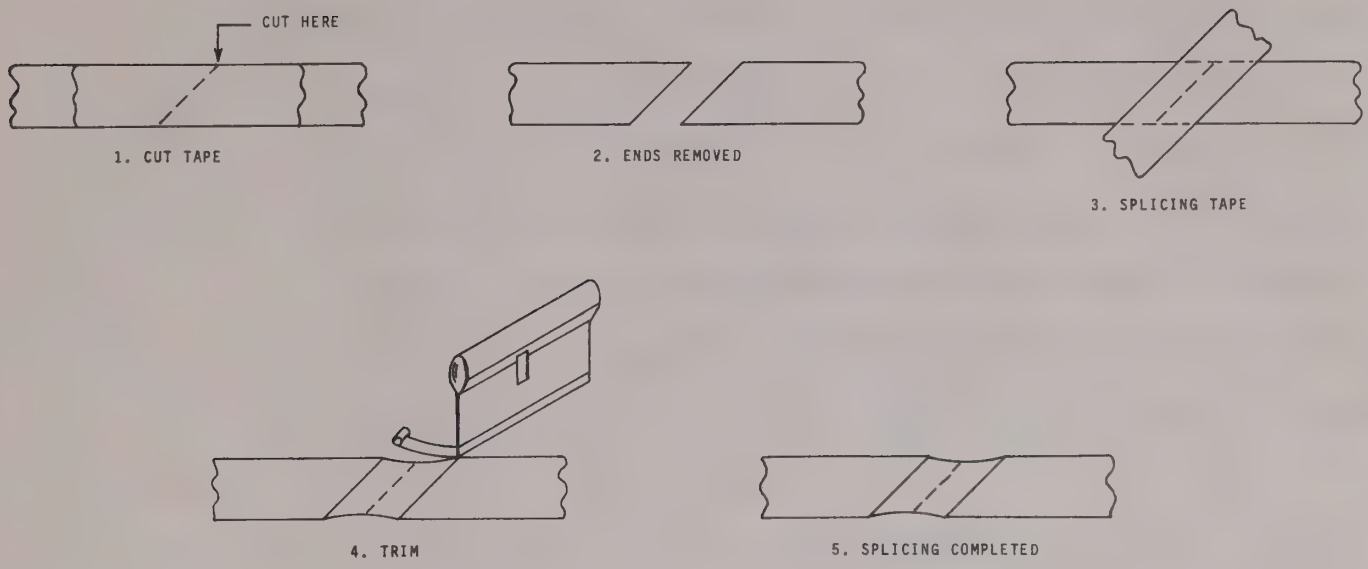


Figure 3-2. Splicing the Tape, Simplified

types, never store unprotected tapes. If stored in original boxes, stand each box edgewise on the shelve. Do not stack boxes horizontally one on top of the other. If boxes are stacked horizontally, the accumulated weight will distort the plastic reels and may damage the edges of the tape. Keep all recorded tapes away from magnetic fields; the magnetic field may erase information on tape. Do not store in cabinets with magnetic latches or near motors or transformers with strong magnetic fields. It is best not to store tape where extremes of temperature or humidity occur. Ideally the storing temperature should be from 60 to 80 degrees F and the relative humidity from 40 to 50%. The use of chemical drying or humidifying agents is not recommended. If tape with cellulose acetate tape becomes brittle or dry, place the reel in a closed container with a moistened sponge for a 24 hour period. Do not allow the moisture to come in contact with the tape. If the tape is to be used in high temperature areas, select a tape with a polyester base. If tape is

exposed to cold temperatures, permit tape to return to equilibrium by opening container and subjecting tape to operating environment for a 24 hour period before using. Tape should always be at room temperature before using. Handle the tape carefully, and keep it covered to protect it from dust and physical damage to the edges. If the tape has been exposed to dust it may be vacuumed or cleaned with a cloth while rewinding. The cloth may be moistened with chemical Freon TF if the dust and dirt does not remove easily. To prepare the tape for storing, the tape should be wound evenly with low tension. This is best accomplished by storing the tape after it has been used without a high speed rewind. Twisting the tape or creasing the tape should be avoided, and the tape should not be touched on the recorded side. Splicing a leader to each end of the tape will protect the tape and the recorded information near the ends of the tape, allowing the full length of the tape to be used for recording. Be sure to use an approved splicing tape to prevent the exposed surface from sticking to adjacent layers of tape. Stored tape should be played periodically, this improves its resistance to storage conditions. Any strain or adhesion will be relieved and its life expectancy increased. The record head, capstan and guides should be cleaned as an additional measure. Make sure that the tape is "A" wound (with oxide in) when storing.

SECTION 4
TROUBLE SHOOTING

4-1. GENERAL.

This section contains information required by maintenance personnel to understand the equipment and trouble shooting data to quickly and efficiently locate the cause of an equipment malfunction or performance deterioration. Information in this section includes: equipment block theory, detail theory, and a trouble shooting table. Part location illustrations are provided in section 5.

Before attempting to test or service the recorder-reproducer, maintenance personnel should be thoroughly familiar with the basic principles of operation (theory) contained in this section and the location and function of the operating controls. Repair procedures are contained in section 5.

4-2. TROUBLE SHOOTING.

Trouble shooting data for this equipment is contained in table 4-1. this data enables the technician to quickly isolate a fault to a circuit or component part. Transistor and terminal voltages are provided on the schematic diagram to aid in trouble shooting.

4-3. REMOVAL OF CHASSIS FROM CASE.

To gain access to all parts, the chassis must be removed from the case. Remove the chassis from the case as follows:

a. Disengage two luggage catches, raise hinged top cover to the 90-degree position, and slide top cover toward the rear to separate the hinges.

b. Remove five screws, flat washers, and lock washers from the top plate.

c. Invert the recorder on a felt or rubber pad and remove the four rubber feet from the bottom of the case.

d. Lift the case from the chassis, tilting it toward the speaker, then disconnect the speaker leads.

e. To replace the chassis in the case, reverse the above procedure. Be sure to reconnect the speaker leads before replacing the chassis in the case.

4-4. THEORY OF OPERATION.

The tape recorder can both record and play back at tape speeds

TABLE 4-1. TROUBLE SHOOTING

Item	Symptom	Probable Cause	Corrective Action
1.	POWER ON lamp does not light.	Loss of primary power.	a. Check and replace fusesF1 and F2. b. Check and replace lamp DS1. c. Check switch S1 and cable W1, repair or replace as required. d. Check T1, replace if faulty.
2.	Capstan pressure roller does not engage with PLAY switch depressed.	Faulty rectifier A2 or relay K1.	a. Check for +30V dc between E29 and terminal 1 on T1. Voltage not present, replace rectifier A2. b. Check +34V between RED and BLK on K1 coil. voltage not present, check contacts of S1 and S4. c. If voltage is present, replace K1
3.	Capstan does not rotate.	Broken capstan drive belt, belt misaligned in speed change mechanism, or faulty capstan drive motor.	a. Replace drive belt. b. Reset speed change control. c. Replace capstan drive motor B2.
4.	Tape will not drive in fast forward.	Open switch contacts on S3 or faulty fast forward motor B1.	a. Replace switch assembly S1-S7. b. Replace fast forward motor B1.
5.	Tape will not drive in fast rewind.	Faulty contacts on relay K1 or memory switch S8.	a. Replace relay K1. b. replace memory switch S8.
6.	Tape spills in stop mode.	S5 contacts open or faulty rewind motor B1.	a. Replace switch assembly S1-S7. b. Replace fast rewind motor B3.

TABLE 4-1. TROUBLE SHOOTING (cont)

Item	Symptom	Probable Cause	Corrective Action
7.	Tape recorded on this recorder will not play back.	a. Faulty playback circuits.	(1) Play pre-recorded tape and check voltage across R44 with speaker switch S7 depressed. (2) Voltage not present, check voltage at E7. If voltage presentat E7, check for 0V at E11 (+34V) indicates faulty PLAY switch) and dc voltages on Q7 through Q11 to isolate faulty component. (3) Voltage not present at E7, check voltage at E4. If voltage is present, replace R3. (4) E4 voltage not present, check dc voltages on Q5 and Q6 to isolate faulty component.
		b. Faulty record circuits.	(1) Record on tape and check VU meter reading. If reading is present, check dc voltages on Q4 to isolate faulty component. (2) Check for approximately 45V ac between E23 and E22 (ground). If not present, check for +30V dc between E24 and Ground. If +30V is present, check Q13 and Q14. (3) If VU reading not present, check voltages on Q1 and Q2 to isolate faulty component.
8.	VU meter reading cannot be obtained.	Faulty record pre-amplifier circuit or faulty meter amplifier circuit.	a. Check voltages on Q1, Q2,and Q3 to isolate faulty component. b. If voltages are normal, check VU meter M1 and replace if required.

of 3.75 or 7.5 inches per second (ips). At the slower speed, playing time is twice that of the higher speed and good quality voice recording can be obtained. At higher tape speed, fidelity is improved. Fast forward and fast rewind speeds are provided. The electronic section of the recorder contains four main sections; the record circuits, playback circuits, a bias oscillator, and a power supply. The tape transport section contains three drive motors (capstan, fast forward, and fast rewind) and the mechanism required to physically move the tape.

4-5. RECORD CIRCUITS.

a. Refer to the block diagram, figure 4-1, and to the schematic diagram, figure 4-2. The record circuits contain two input jacks, one for a microphone and one for a high impedance (bridging) input which can be connected across a low impedance source (such as a loudspeaker coil) with negligible loading effects. When the microphone jack is used, contacts of the jack open the bridging input.

b. Audio signals from the input jacks are amplified in the microphone amplifier, Q1, Q2 and again in record driver Q4, to the level required to drive the playback-record head. The audio signals are then applied to the head through the RECORD contacts of RECORD switch S6. A sample of the audio signals at the collector of microphone amplifier Q2 is taken through R19 and amplified in meter amplifier Q3. The amplified signal is rectified by rectifier diodes CR1 and CR2 to produce a dc signal which fluctuates with the average level of the audio signal peaks. This dc signal is applied to VU (Volume Units) meter M1 to provide a measure of the record signal level.

c. Microphone preamplifier Q1, Q2 is a two stage direct coupled amplifier. R11 provides linear negative feedback to stabilize the

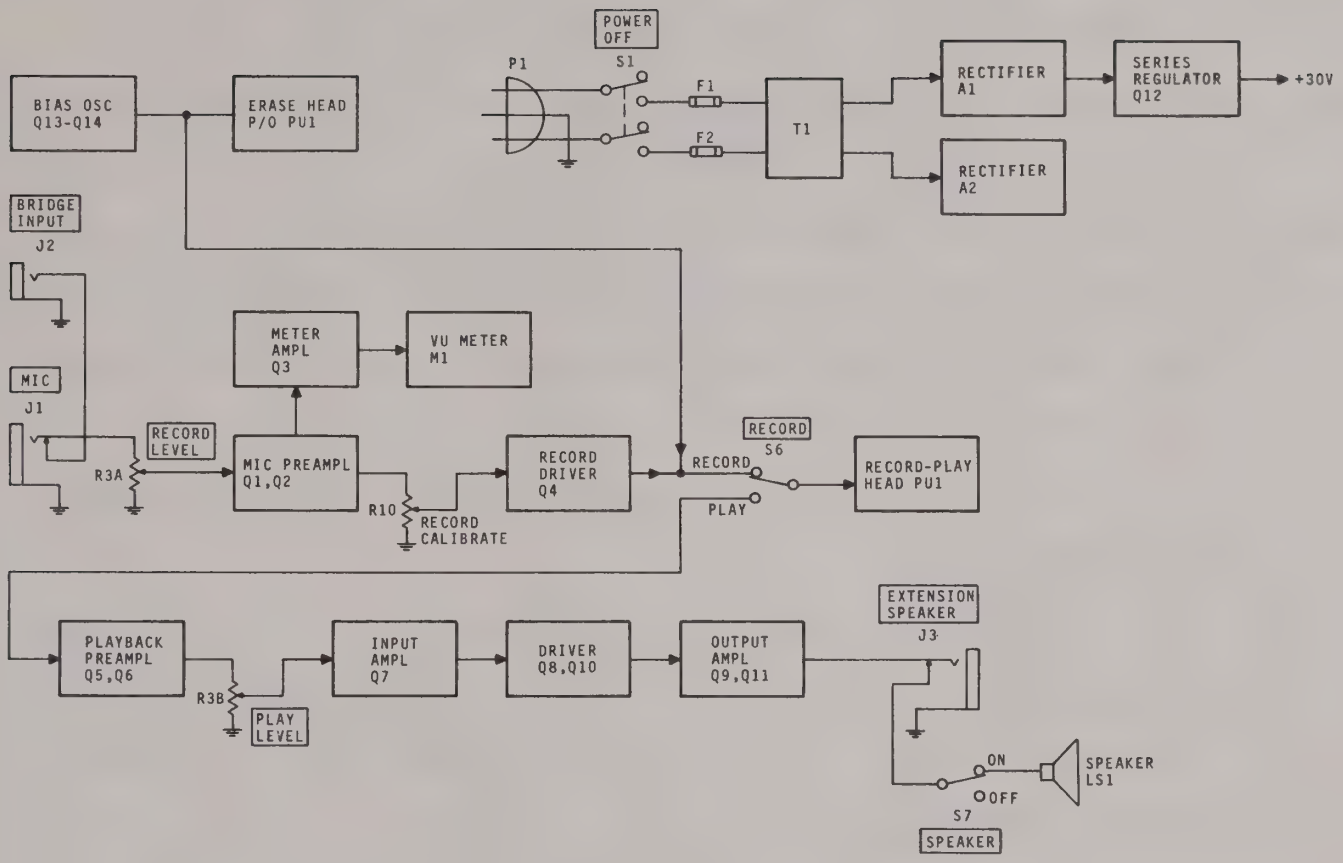


Figure 4-1. Recorder-Reproducer, Block Diagram

amplifier and to improve frequency response. Degenerative feedback is also provided in the emitter circuits to stabilize the dc operating point of the amplifiers. Recording levels are adjusted using RECORD LEVEL control R3A. Record calibrate control R10 adjusts the drive to the record head so that the desired degree of magnetization is produced for a given reading on the VU meter. It is adjusted so that audio peaks reading 0 to +2 on the VU meter just produces magnetic saturation of the tape. R14, C7, R15, and C10 form an equalization network to compensate for response characteristics of the record head so that "flat" response is obtained. R15 and C10 provide low frequency (below 200 Hz) boost while R14 and C7 provide high frequency (above 1500 Hz) boost. In the PLAY position of S6, B+ is applied to the emitter circuit of Q2 to bias it off. In the RECORD position, S6 closes the B+ line, disabling the amplifier.

d. Record driver Q4 amplifies the signal to drive record head PU1. C13, C14, and L2 form a series resonant high frequency boost circuit up to about 20 kHz. Noise above 20 kHz is also suppressed. At tape speeds of 7.5 inches per second, C13 and L2 are used. At tape speeds of 3.75 inches per second, C14 is connected in parallel with C13 by contacts of speed selector switch S9. This increases high frequency respsonse of the recording head at the lower tape speed. L1 and C12 in the collector circuit is a parallel resonant bias trap to isolate the high frequency record bias from amplifier Q4. This reduces loading on the bias oscillator.

4-6. BIAS OSCILLATOR.

a. Refer to block diagram, figure 4-1 and schematic diagram, figure 4-2. Bias oscillator Q13, Q14 produces a supersonic current at a frequency of about 80 kHz. This bias current is used in the erase head to erase the tape before recording and in the record head

CAUTION

DO NOT PLUG-IN A DUMMY PLUG OR OPEN SPEAKER CABLE OR VOICE COIL WHILE MACHINE IS POWERED.

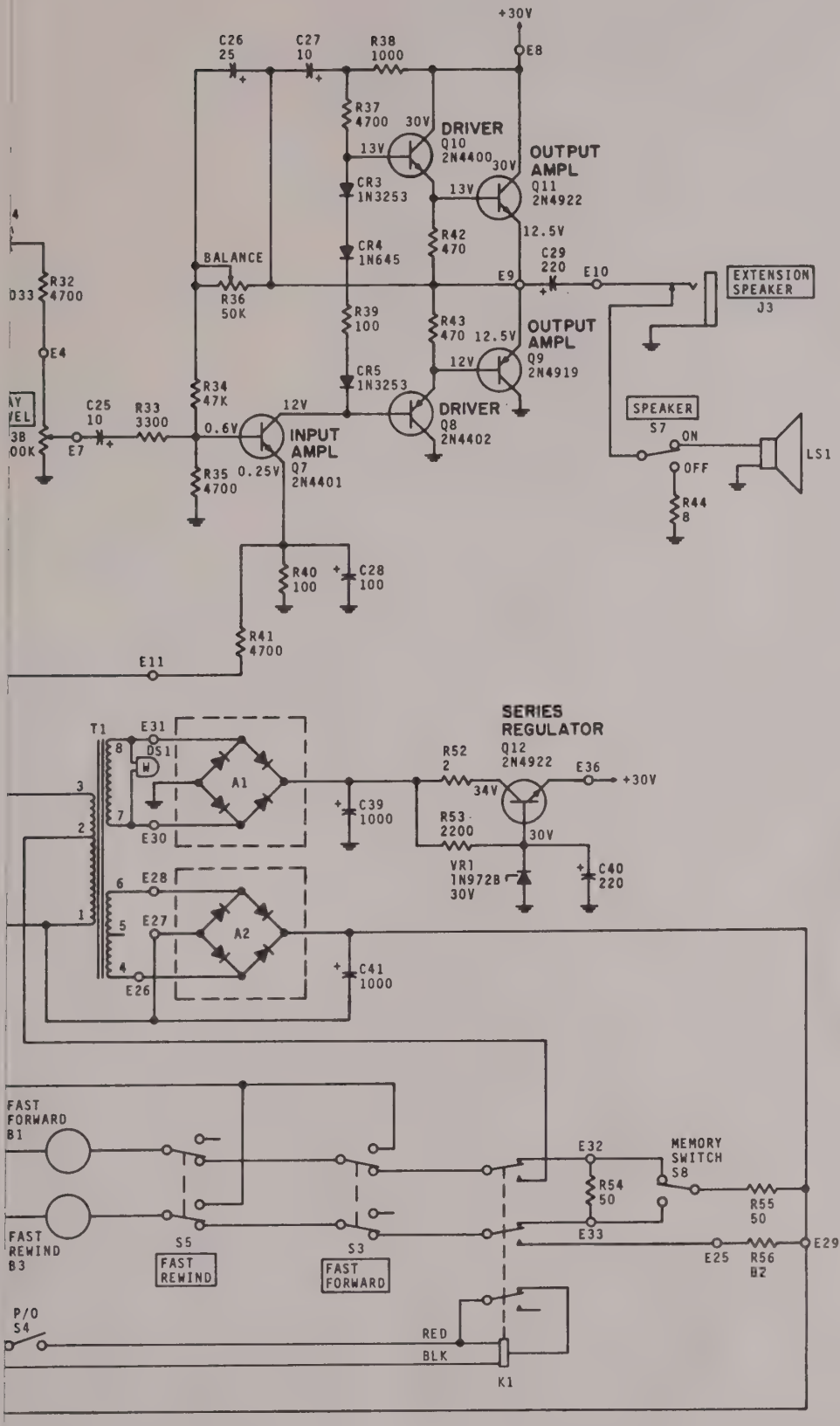


TABLE 1
E TERMINAL VOLTAGES

PLAY MODE VOLTAGES, SEE NOTE 3 FOR CONDITIONS			
E1	1.2V AC	E7	0.45V AC
E2	0.85V AC	E8	+30V DC
E3	0.85V AC	E9	15V AC
E4	0.5V AC	E10	4V AC (APPROX)
E5	+30V DC	E16	+30V DC
RECORD MODE VOLTAGES, SEE NOTE 4 FOR CONDITIONS			
E11	+30V DC	DEPRESS RECORD AND PLAY SWITCHES	
E14	2MV AC		
E17	0.46V AC (APPROX)	E23	45V AC
E18, E19	NOT READABLE	E24	+30V DC
POWER SUPPLY AND DRIVE VOLTAGES			
E25	+13V DC (REFERENCED TO E27)		
E26 TO E28	24V AC		
E29	+34V DC (REFERENCED TO E27)		
E30 TO E31	24V AC		
E32	+23 OR +10V DC (DEPENDS ON POSITION OF S8)		
E33	+23 OR +10V DC (DEPENDS ON POSITION OF S8)		
E36	+30V DC		

Figure 4-2. Recorder-reproducer, schematic diagram

amplifier and to improve frequency response. Degenerative feedback is also provided in the emitter circuits to stabilize the dc operating point of the amplifiers. Recording levels are adjusted using RECORD LEVEL control R3A. Record calibrate control R10 adjusts the drive to the record head so that the desired degree of magnetization is produced for a given reading on the VU meter. It is adjusted so that audio peaks reading 0 to +2 on the VU meter just produces magnetic saturation of the tape. R14, C7, R15, and C10 form an equalization network to compensate for response characteristics of the record head so that "flat" response is obtained. R15 and C10 provide low frequency (below 200 Hz) boost while R14 and C7 provide high frequency (above 1500 Hz) boost. In the PLAY position of S6, B+ is applied to the emitter circuit of Q2 to bias it off. In the RECORD position, S6 closes the B+ line, disabling the amplifier.

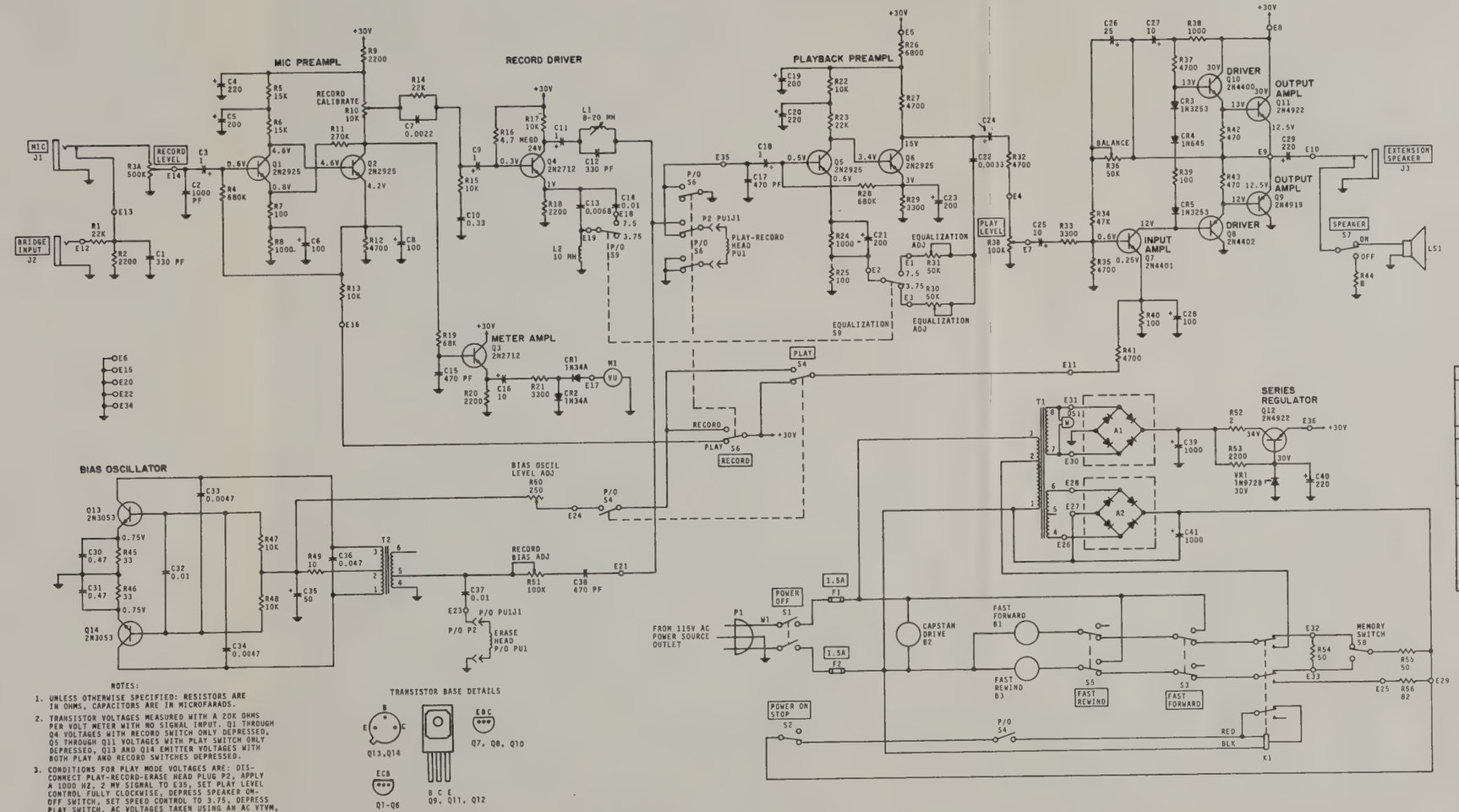
d. Record driver Q4 amplifies the signal to drive record head PU1. C13, C14, and L2 form a series resonant high frequency boost circuit up to about 20 kHz. Noise above 20 kHz is also suppressed. At tape speeds of 7.5 inches per second, C13 and L2 are used. At tape speeds of 3.75 inches per second, C14 is connected in parallel with C13 by contacts of speed selector switch S9. This increases high frequency respsonse of the recording head at the lower tape speed. L1 and C12 in the collector circuit is a parallel resonant bias trap to isolate the high frequency record bias from amplifier Q4. This reduces loading on the bias oscillator.

4-6. BIAS OSCILLATOR.

a. Refer to block diagram, figure 4-1 and schematic diagram, figure 4-2. Bias oscillator Q13, Q14 produces a supersonic current at a frequency of about 80 kHz. This bias current is used in the erase head to erase the tape before recording and in the record head

CAUTION

DO NOT PLUG-IN A DUMMY PLUG OR OPEN SPEAKER CABLE OR VOICE COIL WHILE MACHINE IS POWERED.



NOTES:

1. UNLESS OTHERWISE SPECIFIED: RESISTORS ARE IN OHMS, CAPACITORS ARE IN MICROFARADS.
2. TRANSISTOR VOLTAGES MEASURED WITH A 20K OHMS PER VOLT METER WITH NO SIGNAL INPUT. Q1 THROUGH Q4 VOLTAGES WITH RECORD SWITCH ONLY DEPRESSED, Q5 THROUGH Q11 VOLTAGES WITH PLAY SWITCH ONLY DEPRESSED, Q13 AND Q14 EMITTER VOLTAGES WITH BOTH PLAY AND RECORD SWITCHES DEPRESSED.
3. CONDITIONS FOR PLAY MODE VOLTAGES ARE: DISCONNECT PLAY-RECORD-ERASE HEAD PLUG P2, APPLY A 1000 HZ, 2 MV SIGNAL TO E35, SET PLAY LEVEL CONTROL FULLY CLOCKWISE, DEPRESS SPEAKER ON-OFF SWITCH, SET SPEED CONTROL TO 3.75, DEPRESS PLAY SWITCH. AC VOLTAGES TAKEN USING AN AC VTVM, DC VOLTAGES WITH A MULTIMETER.
4. CONDITIONS FOR RECORD MODE VOLTAGES ARE: APPLY A 1000 HZ, 2 MV SIGNAL TO MIC INPUT JACK, DEPRESS RECORD SWITCH ONLY, ADJUST RECORD LEVEL CONTROL FOR +3 ON VU METER. AC VOLTAGES TAKEN USING AN AC VTVM, DC VOLTAGES WITH A MULTIMETER.

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E26 TO E28	24V AC		
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E30 TO E31	24V AC		
E32	+23 OR +10V DC (DEPENDS ON POSITION OF S8)		
E33	+23 OR +10V DC (DEPENDS ON POSITION OF S8)		
E36	+30V DC		

Figure 4-2. Recorder-reproducer, schematic diagram

to properly magnetize the tape with the audio signals. In erasing, the ac erase signal continually changes the polarity at a constant amplitude. As a given point on the tape approaches and passes the erase head, the magnetic field increases and then decreases linearly to zero. This leaves the tape demagnetized. In the recording head, the bias current (which is about ten times the average audio current) and audio currents are added. Since the current in the record head changes at an audio rate, the residual magnetic pattern on the tape reflects the audio level. Record Bias Adj R51 is adjusted to obtain operation at the "peak bias" mode where a 1 kHz signal is recorded at its maximum level.

b. The bias oscillator is of the push-ull type. Oscillations at the base of the transistors are amplified and developed across tuned circuit C36 and T2. This circuit determines the oscillator frequency. Signals from the collector of each transistor are coupled via C33 and C34 to the base of the opposite transistor to sustain oscillations. C30, C31, R45, and R46 provide dc degeneration to stabilize the operating point of the oscillator. The bias signal is coupled through T2 and C37 to the erase head and to the record head circuit through Record Bias Adj R51 and C38. L1 and C12 is a parallel resonant circuit at the bias frequency. It presents a high impedance and prevents loading of amplifier driver Q4.

c. The bias oscillator is operative only when S6 is in the RECORD position and PLAY switch S4 is depressed. This supplies B+ to the oscillator through contacts of S6 and S4 and Erase Bias Adj R50. Erase Bias Adj R50 varies the oscillator B+ and thus the amplitude of oscillation. It is adjusted for the correct level of erase current. Record Bias Adj R51 is then adjusted for the correct level of record bias.

4-7. PLAYBACK CIRCUITS.

a. Refer to block diagram, figure 4-1, and schematic diagram, figure 4-2. In playback operation, magnetic fields caused by the tape moving past the play head induce audio signals in the head. These signals are coupled through contacts of RECORD switch S6 (in the play position) and C18 to the base of playback preamplifier Q5, Q6. The amplifier uses two direct coupled amplifiers. Dc degenerative feedback from the output to the input is provided by R28 to stabilize the amplifier and improve linearity. Additional dc degeneration is provided by C21 and R24 (for Q5) and R29 and C23 (for Q6). R30, R31, and C22 form an equalization network to provide high frequency boost. Signals from the collector of Q6 are coupled through C22 and either R30 or R31 to R25 in the emitter of Q5. The signals are in phase and increase the gain at high frequencies, when the reactance of C22 decreases. R30 is selected for tape speeds of 3.75 inches per second and R31 for 7.5 inches per second by contacts of S9. The feedback is adjusted using R30 and R31 to obtain "flat" response.

b. The preamplifier output is coupled to the power amplifier input stage Q7 through C24 and PLAY LEVEL control R3B. The audio signals are amplified in Q7 and applied to the bases of driver stages Q8 and Q10. The signal path to Q10 base includes CR3, CR4, R39, and CR5, which provides little attenuation to the audio signals but which establish the dc bias on driver Q10.

c. Driver Q8 and Q10 form a push-pull emitter follower pair which drives output amplifiers Q9 and Q11. Q9 and Q11 form a complimentary emitter follower pair. The output is taken from the common emitter circuit through C29 and applied through contacts of EXTENSION SPEAKER jack J3 and SPEAKER switch S7 to loudspeaker LS1. With S7 in the off position, the speaker is disconnected and the amplifier

is terminated in resistive load R44. When an extension speaker is connected to J3 audio is coupled to the external speaker and contacts of J3 open to disconnect the internal speaker.

d. Drive from Q10, Q11 and Q8, Q9 halves of the power amplifier may be slightly unbalanced due to transistor parameters and differences in other circuit parameters. C27, C26, R36, and R34 establish the operating point of Q10, Q11 with respect to Q8 and Q9. Balance control R36 adjusts the operating point so that equal drive is obtained from each half of the power amplifier.

e. Input amplifier Q7 is operative only during playback when reverse bias is removed by contacts of RECORD switch S6 to R41 and R40. This forward biases the amplifier into normal operation. In RECORD, B+ is applied to reverse bias the stage and disable the amplifier.

4-8. POWER SUPPLY.

a. Primary power is applied through plug P1, POWER OFF switch S1, and fuses F1 and F2 to power transformer T1 and to the tape drive motors. Ac voltages induced in the two secondaries of T1 are rectified by bridge rectifiers A1 and A2. The dc output of A2 is filtered by C41 and applied to dynamic brake section of the tape drive circuit. The dc output of rectifier A1 is filtered by C39 and is applied to series regulator Q12. The base voltage of Q12 is clamped to a reference voltage of 30 volts by zener diode VR1. If the output voltage tends to decrease, the emitter of Q12 tends to become less positive with respect to the base, increasing the forward bias. The emitter to collector impedance then decreases, increasing the output voltage.

SECTION 5

MAINTENANCE

5-1. GENERAL.

a. FAILURE AND PERFORMANCE AND OPERATIONAL REPORTS.

NOTE

The Naval Ships Systems Command no longer requires the submission of failure reports for all equipments. Failure Reports and Performance and Operational Reports are to be accomplished for designated equipments (refer to Electronics Installation and Maintenance Book, NAVSHIPS 0967-000-0100) to the extent required by existing directives. All failures shall be reported for those equipments requiring Failure Reports.

Report each failure of the equipment, whether caused by a defective part, wear, improper operation, or an external cause. Use ELECTRONIC FAILURE REPORT form DD-787. Each pad of the forms includes full instructions for filling out the forms and forwarding them to the Naval Ship Systems Command. However, this report is no longer required except in specific cases as directed by the cognizant agency or command. Be sure to include model designation and equipment serial number (from nameplate), the type number and serial number of the major unit (from the major unit identification plate), and the type number and reference designation of the particular defective part (from the technical manual). Describe the cause of the failure completely, continuing on the back of the form if necessary. Do not substitute brevity for clarity. And remember -- there are two sides to the failure report --

"YOUR SIDE"

Every FAILURE REPORT is a boost for you.

1. It shows that you are doing your job.
2. It helps make your job easier.
3. It insures available replacements.
4. It gives you a chance to pass your knowledge to every man on the team.

"NAVSHIPS SIDE"

The Naval Ship Systems Command uses the information to:

1. Evaluate present equipment.
2. Improve future equipment.
3. Order replacements for stock.
4. Prepare field changes.

Always keep a supply of failure report forms on hand. You can get them from the nearest Forms and Publications Supply Point.

b. This section contains information and instructions needed for repair of the equipment. Information is provided for the removal, repair, and replacement of assemblies, as well as all adjustment procedures. This section also contains all general repair techniques for printed circuit boards, replacement of transistors and diodes, and preventive maintenance, cleaning, and lubricating procedures.

5-2. ADJUSTMENT PROCEDURES.

The adjustment procedures outlined in a through f below provide all required adjustments for the recorder. All adjustment controls are set at the factory and normally do not require readjustment unless a repair has been made in a particular circuit which would affect an adjustment setting. If a complete readjustment of the recorder is to be made, perform the procedures in the sequence given (a through f). Remove the chassis from the case (paragraph 4-3) to gain access to all adjustment controls.

WARNING

115V ac is present at TB3. Use extreme caution.

a. OUTPUT AMPLIFIER ADJUSTMENT.

(1) Connect dc voltmeter between E9 on printed circuit board, and ground.

(2) Set voltmeter to 50 volt range.

(3) Depress POWER ON switch.

(4) Voltmeter should read 30 volts.

(5) Depress PLAY switch.

(6) Adjust Balance Adj control R36 for a voltmeter reading of 15V dc.

(7) Disconnect dc voltmeter.

b. DEMAGNETIZING THE HEAD.

It is necessary to periodically demagnetize the record-reproduce head because it has a tendency to become magnetized from stray magnetic fields and improper usage. A magnetized head will have an increased noise level, distorted signals, and a poor response to high frequencies. A demagnetizer is the only equipment needed.

(1) Place a piece of masking tape or insulated tubing over the tips of the demagnetizer.

(2) Remove the tape from the transport; make sure that the power switch of the recorder is in the "OFF" position.

(3) Remove the head cover to expose the record head.

(4) Plug the demagnetizer into a 120 volt AC source.

(5) Bring the tips of the demagnetizer in contact with the face of the record-reproduce head. With an even motion slowly move the tips of the demagnetizer back and forth; make sure that the tips are on both sides of the gap.

(6) Withdraw the demagnetizer slowly to insure complete

demagnetization.

(7) Disconnect the demagnetizer from the power source.

(8) Replace the head cover on the recorder.

c. PLAY EQUALIZATION AND AZIMUTH ADJUSTMENT.

Alignment test tapes are required to perform equalization and azimuth adjustment (table 1-2). A running narrative on the tape tells what test tone frequencies are being played and their level. In order to hear the narrative and test tones, a high impedance audio amplifier with a speaker must be connected to the output jack of the distortion analyzer. The distortion analyzer is used in the vtvm mode. De-magnetize the head in accordance with paragraph b above before performing this procedure.

(1) Remove protective cover from the play-record head by removing two screws, lockwashers, and flat washers.

(2) Place the 3.75 ips test tape on the supply reel disk and an empty reel on the takeup reel disk.

(3) Thread the tape and start it on the empty reel.

(4) Connect distortion analyzer, terminated in an 8-ohm non-inductive resistor, to the EXTENSION SPEAKER jack. Connect oscilloscope and audio amplifier to distortion analyzer output.

(5) Depress POWER ON switch and set SPEED control to UP 3.75 ips position.

(6) Depress PLAY switch.

(7) Listen for 500 Hz reference level tone on the test tape and adjust PLAY LEVEL control for 1.0V as indicated on the distortion analyzer meter. This is the reference level.

(8) Listen for the next tone(7500 Hz) and adjust head azimuth adj screw for maximum indication on distortion analyzer.

(9) Listen for next tone (5000 Hz) and adjust 3.75

Equalization Adj control R30 for a reading of 1.0V on distortion analyzer.

(10) Observe the distortion analyzer while playing remainder of the test tones. All test tones, with the exception of the last tone (500 Hz) at operating level should be within ±4 db of the reference level tone (1.0V). The last tone (500 Hz at operating level) should be 3.2 volts

(11) The procedure for the 7.5 Equalization Adj control adjustment is the same as for the 3.75 above except that the 7.5 ips test tape is used, the reference level tone is 700 Hz, and Equalization Adj control R31 is adjusted at the 7500 Hz test tone. Omit step 7, the azimuth adjustment is not repeated.

(12) Upon completion of the 7.5 Equalization, disconnect test equipment and replace the protective cover (removed in step (1) on the play-record head.

d. BIAS TRAP ADJUSTMENT.

(1) Connect ac voltmeter positive lead to positive side of capacitor C11 (collector of record driver Q4) and common lead to E20 on printed circuit board.

(2) Depress POWER ON switch.

(3) Depress RECORD and PLAY switches simultaneously.

(4) Set ac voltmeter to a scale which will provide a reading.

(5) Adjust Bias Trap coil L1 for a minimum reading on ac voltmeter.

(6) Disconnect ac voltmeter.

e. ERASE BIAS ADJUSTMENT.

(1) Disconnect plug P2 from record-play-erase head PU1.

(2) Connect the ac voltmeter positive lead to E23 and the common lead to E22 on the printed circuit board.

(3) Adjust Erase Bias Adj control R50 for a reading of 45 volts as indicated on the ac voltmeter.

(4) Disconnect ac voltmeter.

f. RECORD LEVEL CALIBRATION AND RECORD BIAS ADJUSTMENT.

(1) Disconnect plug P2 from record-play-erase head PU1.

(2) Connect signal generator to BRIDGE INPUT connector.

(3) Adjust signal generator frequency for 1000 Hz at a level of 1 volt.

(4) Depress the POWER ON switch.

(5) Depress the RECORD switch only (do not depress the PLAY switch).

(6) Adjust the RECORD LEVEL control for a VU meter reading of +3.

(7) Adjust Record Calibrate control R10 for an ac voltmeter reading of 1.25 volts.

(8) Depress the RECORD and PLAY switches simultaneously.

(9) Adjust Record Bias Adj control R51 for a reading of 24 volts as indicated on the ac voltmeter connected to erase head terminals of P2.

(10) Disconnect test equipment and reconnect plug P2 to the record-play-erase head.

5-3. REMOVAL AND REPLACEMENT OF PRINTED CIRCUIT BOARD.

a. Remove chassis from the case (Paragraph 4-3).

b. Remove three screws which secure chassis end plate to mechanical chassis and fan end plate away from mechanical chassis.

c. Remove five nuts and lockwashers which secure printed circuit board to chassis end plate.

NOTE

Printed circuit board assembly may now be serviced without complete removal. If it is necessary to completely remove the board, proceed to step d below.

d. Unsolder and clearly tag all interconnecting leads from terminals around the periphery of the board.

e. Remove printed circuit board and retain insulation material to be used when board is replaced.

f. Replacement of the printed circuit board assembly is essentially the reverse of the removal procedure. Be sure all interconnecting leads are connected to the proper terminals on the board and that the insulation material is placed between the board and chassis end plate.

5-4. REMOVAL AND REPLACEMENT OF TOP PANEL.

Removal of the top panel provides access to remove, service, or replace parts mounted on the tape transport mechanical chassis. Remove top panel as follows:

a. Remove chassis from case (Paragraph 4-3).

b. Remove record head protective cover by removing two screws, lockwashers and flat washers.

c. Remove capstan pressure roller by removing one screw, lockwasher, and retaining plate, then lift pressure roller and two flat

washers (at top and bottom of pressure roller).

d. Lift speed control knob and rotate knob counterclockwise to remove it from threaded control shaft.

e. Remove RECORD LEVEL control knob by loosening two setscrews and lifting knob from shaft, then lift PLAY LEVEL control plate from shaft.

f. Disconnect plug from record head and place it in slot in top plate.

g. Remove two nuts, screws, lock washers, and flat washers (one at each side of top panel) then lift top panel free of chassis.

h. Replacement of top panel is essentially the reversal of removal. When reconnecting the record head plug, grooved end of plug must be up toward top of record head.

5-5. REMOVAL AND REPLACEMENT OF TAPE DRIVE BELTS.

a. CAPSTAN DRIVE BELT.

(1) Remove chassis from case (Paragraph 4-3).

(2) From bottom of chassis, slip drive belt off capstan drive pulley and over capstan drive motor fan blade.

CAUTION

Do not bend capstan drive motor fan blades when removing drive belt.

(3) Replace capstan drive belt by reversing steps 1 and 2.

b. COUNTER DRIVE BELT.

(1) Remove chassis from case (Paragraph 4-3).

(2) Remove top panel (Paragraph 5-4).

(3) Slip belt off counter drive pulley, then up through hole in chassis and over the reel pedestal.

(4) Slip new belt over reel pedestal and down through hole in chassis.

(5) Make sure belt is in groove of pulley on motor shaft, then slip belt over counter drive pulley and into its groove.

(6) Replace top panel and reinstall chassis in case.

5-6. REMOVAL AND REPLACEMENT OF TAPE DRIVE MOTORS.

Remove chassis from case (Paragraph 4-3) and remove top panel from chassis (Paragraph 5-4) to gain access to parts.

a. CAPSTAN DRIVE MOTOR.

(1) Unsolder and tag the two black motor power leads.

(2) Remove fan blade from motor shaft by loosening two setscrews.

(3) Remove capstan drive belt.

(4) Remove three screws and lockwashers which mount motor to chassis and remove motor.

(5) If motor is to be replaced by a new one, remove drive pulley from motor shaft by loosening one setscrew.

(6) Install drive pulley on shaft of new motor and tighten setscrew.

(7) Mount new motor on chassis using three screws and lock washers removed in step (4).

(8) Reinstall capstan drive belt.

(9) Install fan blade on motor shaft.

(10) Reconnect motor power leads as tagged in step (1).

b. FAST REWIND MOTOR.

(1) Unsolder and tag the two brown motor power leads.

(2) Remove reel pedestal from motor shaft by loosening one setscrew and slipping pedestal off motor shaft.

(3) Remove counter drive belt by slipping it off pulleys on motor shaft and counter.

(4) Remove threaded spacer from one corner of motor housing.

Note the corner of motor on which space is mounted since it must be reinstalled in the same position.

(5) Remove three screws and lockwashers which mount motor to chassis and remove motor.

(6) If motor is to be replaced by a new one, remove drive pulley from motor shaft by loosening one setscrew, then install the pulley on shaft of new motor.

(7) Remove nut from motor housing at same corner noted in step (4), and install threaded spacer in its place.

(8) Mount motor on chassis (with threaded spacer in proper position) using three screws and lock washers removed in step (5).

(9) Reinstall counter drive belt, making sure it is in grooves of pulleys on motor shaft and counter.

(10) Reinstall reel pedestal on motor shaft.

(11) Reconnect motor power leads as tagged in step (1).

c. FAST FORWARD MOTOR.

(1) Unsolder and tag two white motor power leads.

(2) Remove reel pedestal from motor shaft by loosening one setscrew and slipping pedestal off motor shaft.

(3) Remove terminal strip from corner of motor housing by removing nut and lockwasher and slipping it off motor housing retaining screw. Replace lockwasher and nut on motor housing screw.

(4) Remove threaded spacer and cable clamp from corner of motor housing.

(5) Remove three screws and lockwashers which mount the motor to the chassis and remove the motor.

(6) To replace motor, install motor and attach using three screws and lockwashers removed in step (5).

(7) Remove nut and lockwasher from corner of motor housing

(toward front and outer edge of chassis) and place cable clamp and lockwasher on screw and secure using threaded spacer instead of nut.

(8) Remove nut and lockwasher from adjacent corner of motor housing (toward front and center of chassis), place terminal strip on screw, and secure using the lockwasher and nut.

(9) Install reel pedestal on motor shaft and tighten set-screw.

(10) Reconnect motor power leads as tagged in step (1).

5-7. REMOVAL AND REPLACEMENT OF VU METER

Remove chassis from case (Paragraph 4-3) and remove top panel from chassis (Paragraph 5-4) to gain access to parts.

a. Unsolder meter, meter negative lead (center terminal).

b. Remove two screws and lockwashers holding meter and meter positive lead to mounting bracket, then remove meter through top of chassis.

c. To replace meter, place meter through hole in chassis and attach meter and meter positive terminal lead to mounting bracket using screws and lock washers removed in step b.

d. Reconnect and solder meter, meter negative lead (center terminal).

e. Reinstall top panel and replace chassis in case.

5-8. REMOVAL AND REPLACEMENT OF COUNTER

Remove chassis from case (Paragraph 4-3) and remove top panel from chassis (Paragraph 5-4) to gain access to parts.

a. Remove VU meter (Paragraph 5-7).

b. Slip counter drive belt off counter drive pulley.

c. Remove nut and lockwasher which attaches meter terminal strip and remove terminal strip from screw.

d. Remove two screws (from top of chassis) and remove counter

assembly from bottom of chassis.

e. To replace counter, place counter in position from bottom of chassis and attach using two screws removed in d above. Use flat head screw nearest front of chassis (near VU meter) to prevent interference with meter.

f. Replace meter terminal strip on flat head screw and secure using lockwasher and nut removed in step c.

g. Reinstall VU meter.

h. Slip counter drive belt over counter drive pulley. Make sure belt is in grooves of pulleys on motor shaft and counter.

i. Reinstall top panel and replace chassis in case.

5-9. REMOVAL AND REPLACEMENT OF OPERATE SWITCH ASSEMBLY.

Remove chassis from case (Paragraph 4-3) and remove top panel from chassis (Paragraph 5-4) to gain access to parts.

a. Remove three screws which secure chassis end plate to mechanical chassis and fan end plate away from mechanical chassis.

b. Remove two screws and lockwashers (one from each end of switch assembly).

c. Pull switch free of bottom of chassis as far as leads will permit, then unsolder and tag leads to clearly identify switch sections and terminals to which they connect.

d. Remove switch assembly.

NOTE

POWER OFF switch may be individually replaced without removing switch assembly by unsoldering four leads, removing one screw, and slipping switch off tang on switch assembly and installing new switch.

e. To replace switch assembly, connect leads as tagged in step

f. Place switch assembly in mounting hole from bottom of chassis and secure it using two lockwashers and screws removed in steb b.

g. Reinstall chassis end plate using three lockwashers and screws removed in step a.

h. Reinstall top panel and replace chassis in case.

5-10. PREVENTIVE MAINTENANCE.

Preventive maintenance consists of periodic lubrication and cleaning of the equipment and replacement of the capstan drive belt every 500 hours of operation. Removal and replacement procedure for the capstan drive belt is given in Paragraph 5-5a.

5-11. LUBRICATION

a. SCHEDULE. All items requiring lubrication, the recommended lubricant, and the lubrication schedule are itemized in Table 5-1.

ITEM	RECOMMENDED LUBRICANT	SCHEDULE (HRS OF OPERATION)
Capstan drive shaft	Fine machine oil	50 maximum
Capstan pressure roller	Lubriplate	50
Pressure roller activation plate	Lubriplate	1,000
Operate switch assembly slides	Lubriplate	1,000

b. PROCEDURE. The capstan drive shaft and capstan pressure roller may be lubricated without removing the chassis from the case. Apply a fine grade of machine oil, using a dropper or needle type applicator, into the bearing around the shaft. Remove the capstan pressure roller (by removing one screw, lockwasher, and retaining plate) and apply lubriplate to all surfaces of the pressure roller mounting shaft. To gain access to the pressure roller activation plate and the switch assembly slides, remove the chassis from the

case (Paragraph 4-3) and remove the top panel from the chassis (Paragraph 5-5). Apply a liberal amount of lubriplate on both surfaces of the pressure roller activation plate around the two elongated slide holes. Apply lubriplate to the slide surfaces of the switch assembly.

5-12. CLEANING.

Cleaning the record-reproduce-erase head, the capstan, capstan pressure roller, and other surfaces not requiring disassembly of the equipment is normally performed by the operator (Paragraph 3-5a). Cleaning internal parts, surfaces, air intake and exhaust screens, etc., should be accomplished by the maintenance technician on a scheduled routine basis and each time the chassis is removed from the case for maintenance or repair. Remove loose dust and foreign material using a soft bristled brush and an air hose. Remove any grease or grime from metal chassis, motor housings, and other mechanical parts using a clean lint free cloth moistened with solvent (such as trichlorthane).

5-13. GENERAL REPAIR TECHNIQUES.

Several precautions must be observed when repairing printed circuit boards and soldering diodes and transistors. These items can be ruined if care is not used.

a. REPAIRING PRINTED CIRCUIT BOARDS. (Refer to figure 5-1) A printed circuit board is used to replace conventional wired-chassis contruction for the electronic circuitry. The board is made of insulating material plated with a conducting pattern. When soldering, be careful to avoid overheating. Overheating could loosen the plating bond and fracture the plating or it could lower the dielectric constant of the board and cause leakage currents in high impedance circuits. Use solder with a low melting point such as 60/40 solder. If a strip

of plating, or the board itself, is broken, it can be repaired as shown in figure 5-1. The printed wiring is covered with a fungus proof coating, therefore, the coating should be removed in the area to be repaired before soldering.

b. SERVICING TRANSISTORIZED EQUIPMENT. Servicing transistorized circuitry is similar to servicing equivalent vacuum tube circuitry. However, some special techniques must be acquired before servicing transistorized equipment. Some of these are listed below.

(1) When using battery eliminator bench type power supplies, the ripple voltage should be held to a minimum. The output of the supply should be well regulated to prevent exceeding the safe potential limits under varying load conditions. The proper polarity must be observed to prevent damage to transistors.

(2) When transistor replacement is required, avoid overheating the transistor while soldering. Excessive heat from the soldering iron can also damage other transistors close by. When replacing diodes or transistors, use a small soldering iron (25 to 40 watts). With a pair of long nose pliers, hold the lead between the part and the soldering iron. Before installing a new transistor, check for circuit defects which may damage the new transistor.

(3) Ohmmeters or multimeters should have a sensitivity of 20,000 ohms per volt, or better, on all voltage ranges. Meters with a lower sensitivity draw too much current from the circuits and cause inaccuracies; in addition, high current may damage the transistors.

(4) Soldering guns or irons of the heavy duty type should never be used. A check for current leakage should be made on all soldering irons used, or they should be operated from an isolation

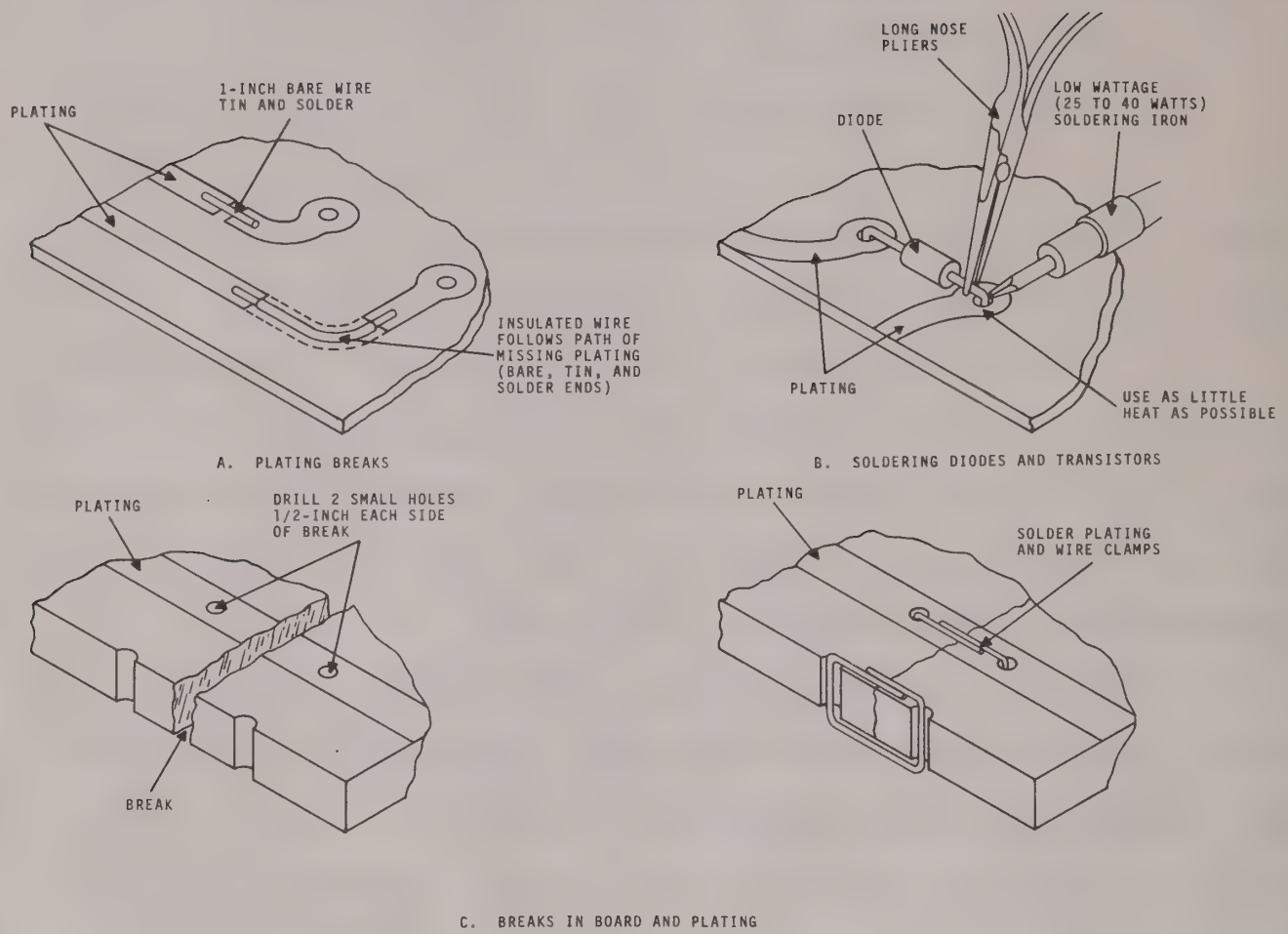


Figure 5-1. Printed Circuit Board Repair Techniques

transformer.

(5) Never remove or replace a transistor while the equipment is turned on because surge currents may damage the transistors.

(6) Short circuits of any kind are likely to damage transistors. When making meter checks, avoid accidental shorts between adjacent terminals by insulating the meter test prod, leaving only about 1/8 inch of the tip exposed.

(7) Do not connect a ground lead from test equipment to heat sink because the heat sink may not be common to the chassis.

(8) If the transistor being replaced is heat sinked, be sure to heat sink the replacement transistor.

5-14. MAINTENANCE STANDARDS.

Procedures for testing the recorder to insure that it meets acceptable performance standards are given below. These tests should be performed at a time equipment performance is optimum and a table of reference standards with which the measured values can be compared should be prepared. Subsequent performance values can then be observed for signs of progressive deterioration which would indicate the need for corrective maintenance prior to equipment failure. These tests should be performed every 1000 hours of operation and after major repairs before returning recorder to stock for reissue.

These procedures assume that the technician making the performance tests is thoroughly familiar with operating procedures and therefore, specific control settings to perform the functions are not required.

a. OPERATIONAL TEST. Perform the procedure below to determine that the recorder is operating. Observe that all controls are functioning as tho procedure is performed. Refer to test setup diagram, figure 5-2 for general test setup.

(1) Place a full reel of tape on the feed reel pedestal and

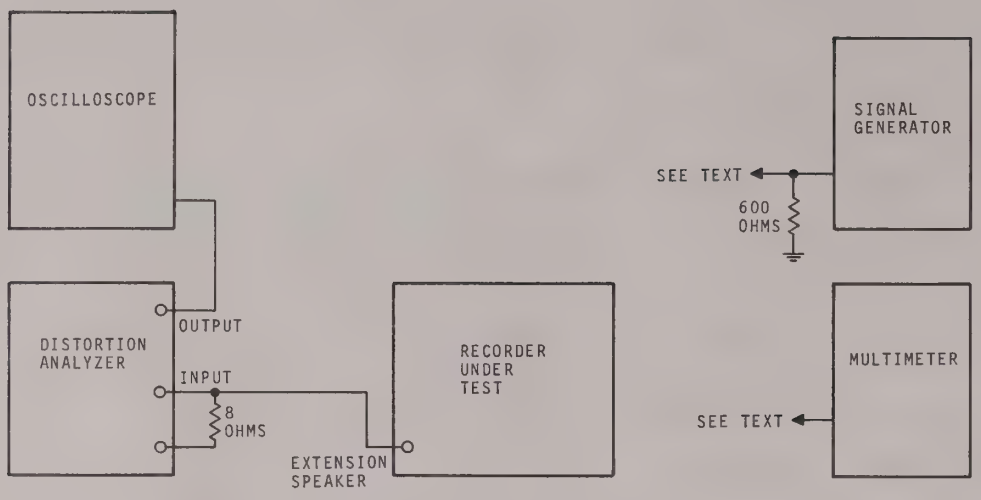


Figure 5-2. Recorder-Reproducer, Test Setup

thread the tape over the guides, head, capstan and onto the takeup reel.

(2) Record voice using microphone at both 3.75 i.p.s. and 7.5 i.p.s.

(3) Record music from an external radio or other music source using attachment cord through BRIDGE INPUT connector. Record at both 3.75 i.p.s. and 7.5 i.p.s.

(4) Rewind the tape and play back the recorded portions through the internal speaker.

(5) The reproduced voice and music should be clear and intelligible on the internal speaker.

(6) Repeat steps (4) and (5) using an external speaker connected to the EXTENSION SPEAKER jack.

b. TAPE SPEED TEST. A stop watch and a 1200 foot roll of tape are required to perform the tape speed test. The tape shall be marked to identify three sections each of which are 450 inches (37.5 feet) long. One section shall be marked at the beginning, one section at the mid-portion, and one at the end of the tape.

(1) Thread the tape on the recorder.

(2) Set the Speed control for 7.5 i.p.s.

(3) Using the stop watch, check the time required for each marked section to pass a given point on the top plate.

(4) The time required for passage of each section of the tape shall be: front end section, 60 +3 seconds; middle section, 60 +1.2 seconds; and rear end section, 60 +3 seconds.

(5) Rewind the tape and repeat step (3) with the speed control set for 3.75 i.p.s.

(6) The time required for passage of each section of the tape shall be: front end section, 120 +6 seconds; middle section,

120 +2.4 seconds; rear end section, 120 +6 seconds.

(7) Using a stop watch, check the time required to completely run the 1200 foot roll of tape through the recorder in the fast forward and fast rewind modes of operation. The time required for either direction shall be not more than 150 seconds.

c. RECORD LEVEL INDICATOR (VU METER) TEST.

(1) Connect signal generator to MIC jack using attachment cord. Set signal generator frequency to 1000 Hz and output to minimum.

(2) Increase signal generator output level for a reading of +3 VU on VU meter.

(3) Reduce signal generator output level 6db. VU meter should read -3 VU.

d. FLUTTER AND WOW TEST.

(1) Connect test signal output of flutter meter to BRIDGE INPUT jack on recorder using attachment cord.

(2) Connect test input of flutter meter across an 8-ohm resistor.

(3) Depress RECORD switch and set RECORD LEVEL control for 0 VU indication on VU meter.

(4) Using a new blank reel of tape, record 60 seconds of test signal at both 7.5 i.p.s. and 3.75 i.p.s. near the center portion of the tape.

(5) Disconnect flutter meter test signal output from recorder and rewind tape.

(6) Connect EXTENSION SPEAKER jack, using attachment cord across the 8-ohm resistor at the test input of the flutter meter.

(7) Play back recorded test signals while observing the flutter meter in the weighted position.

(8) Flutter and wow shall not exceed 0.3% at either speed with the flutter meter in the Slow Meter position for any 60 second recorded signal. The flutter meter in the Fast Meter position, shall not indicate more than three peaks in any 10 second portions of the recorded signals. Disconnect flutter meter.

e. OUTPUT POWER AND DISTORTION TEST.

(1) Connect signal generator output to distortion analyzer and measure and record distortion content of generator output at 100 Hz, 1000 Hz, 3000 Hz, 5000 Hz, and 7500 Hz.

(2) Connect signal generator output to MIC jack on recorder.

(3) Connect distortion analyzer to EXTENSION SPEAKER jack across a precision (1%) 8-ohm resistor.

(4) Connect ac vtvm to signal generator output jack to set and monitor output signal levels.

(5) Set signal generator frequency to 1000 Hz and output level for 2 mv as indicated on ac vtvm.

(6) Depress RECORD switch and adjust RECORD LEVEL control for +3 VU indication on VU meter.

(7) Set SPEED control for 3.75 i.p.s.

(8) Record 1000 Hz signal for 60 seconds.

(9) Set signal generator frequency for 100 Hz and output level for 2 mv.

(10) Record 100 Hz signal for 60 seconds.

(11) Set signal generator frequency for 1000 Hz and output level for 200 mv.

(12) Record this signal for 30 seconds.

(13) Set signal generator frequency for 3000 Hz and output evel for 200 mv.

(14) Set RECORD LEVEL control for -3 VU on the VU meter.

(15) Record this signal for 60 seconds.

(16) Set signal generator frequency for 5000 Hz and output level for 200 mv.

(17) Set RECORD LEVEL control for -9 VU on VU meter.

(18) Record this signal for 60 seconds.

(19) Set SPEED control for 7.5 i.p.s. and repeat steps (8) through (18).

(20) Rewind the tape.

(21) Observing distortion analyzer in VTVM mode, while playing back the first recorded 1000 Hz signal, set the PLAY LEVEL control for a 4-volt indication on the distortion analyzer meter. This sets recorder output for 2 watts at 1000 Hz reference.

(22) Rewind tape and measure distortion at all recorded frequencies. Do not change the setting of the PLAY LEVEL control. Measured distortion at any frequency shall not exceed 5%.

(23) Rewind tape and set SPEED control for 7.5 i.p.s.

(24) Connect signal generator to MIC jack.

(25) Set signal generator frequency to 1000 Hz and output level for 100 mv.

(26) Depress RECORD switch and adjust RECORD LEVEL control for +3 VU on VU meter.

(27) Record 60 seconds of this signal.

(28) Set signal generator output level for 100 mv.

(29) Record 60 seconds of this signal.

(30) Connect signal generator to BRIDGE INPUT jack.

(31) Set signal generator frequency to 100 Hz and output level for 10 volts.

(32) Adjust RECORD LEVEL control for +3 VU on VU meter.

(33) Record 60 seconds of this signal.

(34) Set signal generator frequency to 1000 Hz and output level for 10 volts.

(35) Adjust RECORD LEVEL control for +3 VU on VU meter.

(36) Record 60 seconds of this signal.

(37) Set signal generator frequency to 3000 Hz and output level for 10 volts.

(38) Adjust RECORD LEVEL control for -3 VU on VU meter.

(39) Record 60 seconds of this signal.

(40) Set signal generator frequency to 5000 Hz and output level for 10 volts.

(41) Adjust RECORD LEVEL control for -9 VU on VU meter.

(42) Record 60 seconds of this signal.

(43) Set signal generator frequency to 7500 Hz and output level for 10 volts.

(44) Adjust RECORD LEVEL control for -9 VU on the VU meter.

(45) Record 60 seconds of this signal.

(46) Rewind tape.

(47) Connect distortion analyzer to EXTENSION SPEAKER jack across a precision (1%) 8-ohm resistor.

(48) Observing distortion analyzer in VTVM mode, while playing back the 1000 Hz recorded signal, adjust PLAY LEVEL for 4 volts as indicated on distortion analyzer meter. This sets recorder output for 2 watts at 1000 Hz reference.

(49) Rewind tape and measure distortion at all recorded frequencies. Do not change setting of PLAY LEVEL control. Measured distortion should not exceed 5%.

f. FREQUENCY RESPONSE TEST.

(1) Connect signal generator to MIC jack.

(2) Set SPEED control for 7.5 i.p.s.

(3) Set signal generator frequency to 500 Hz and output level for 20 mv.

(4) Adjust RECORD LEVEL control for -12 VU on VU meter.

(5) Record 60 seconds of this frequency.

(6) Repeat steps (4) and (5) with signal generator set to the following frequencies at an output level of 20 mv: 7500 Hz, 5000 Hz, 2500 Hz, 1000 Hz, and 100 Hz.

(7) Repeat steps (3) through (6) with signal generator connected to BRIDGE INPUT jack and output level of 500 mv.

(8) Repeat steps (3) through (7) with SPEED control set to 3.75 i.p.s.

(9) Connect distortion analyzer in VTVM mode to the EXTENSION SPEAKER jack across an 8-ohm resistor.

(10) Rewind tape and play back the first 500 Hz recorded signal and set PLAY LEVEL control for an output level of 0.7 volts as indicated on the distortion analyzer meter. Leave LEVEL control set at this point.

(11) Play back each frequency recorded at 7.5 i.p.s. and each frequency recorded at 3.75 i.p.s. and record voltage level indicated on distortion analyzer meter.

(12) Output voltage levels shall be between 0.43 and 1.1 volts, with the PLAY LEVEL control still set to the reference level of step (10).

g. SIGNAL-TO-NOISE RATIO TEST.

(1) Connect signal generator to BRIDGE INPUT jack.

(2) Set signal generator frequency to 1000 Hz and output level for 500 mv.

(3) Depress RECORD switch and set RECORD level for +3 VU as indicated on VU meter.

(4) Set SPEED control for 7.5 i.p.s. and record five minutes of this signal.

(5) Depress FAST FORWARD switch and completely wind remainder of tape on take-up reel.

(6) Reverse the reels, rethread tape, and record five minutes of this same signal.

(7) Rewind the tape.

(8) Connect distortion analyzer in vtvm mode to EXTENSION SPEAKER jack across an 8-ohm resistor.

(9) Depress PLAY switch and set PLAY LEVEL control for an output level of four volts as indicated on distortion analyzer meter. Do no change PLAY LEVEL control setting.

(10) Depress FAST FORWARD switch and completely wind remainder of tape on take-up reel.

(11) Disconnect signal generator.

(12) Reverse the reels, rethread tape, and record five minutes of no signal input over the previously recorded signal (step 4).

(13) Rewind the tape and, observing the distortion analyzer meter, play back the no signal input recorded portion of tape. (The PLAY LEVEL control must still be as set in step 9.) The output voltage level, as indicated on the distortion analyzer shall not be greater than 88 mv (35db. signal-to-noise ratio).

(14) Disconnect test equipment, maintenance standards tests are complete.

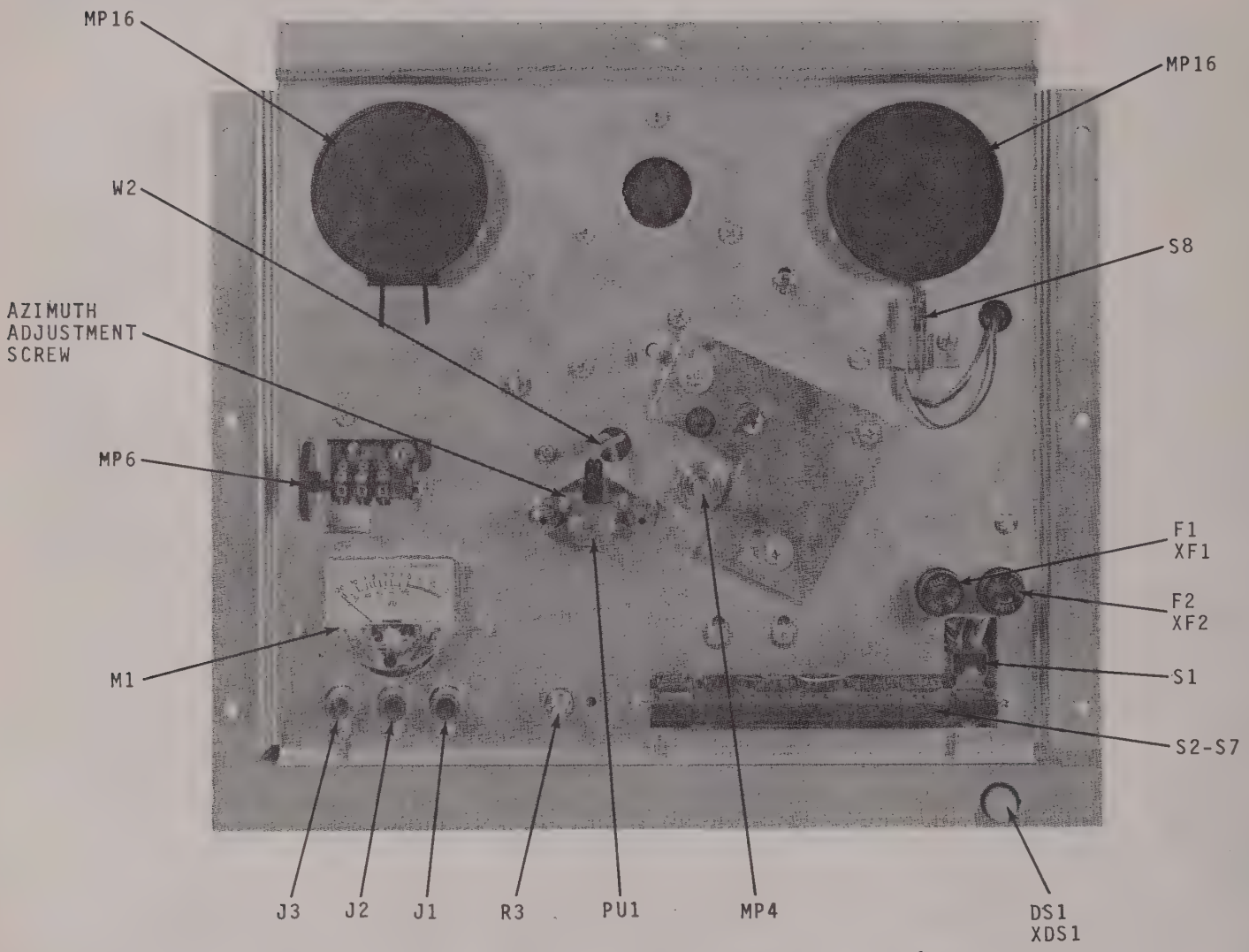


Figure 5-3. Recorder-Reproducer, Top Panel Removed, Parts Location

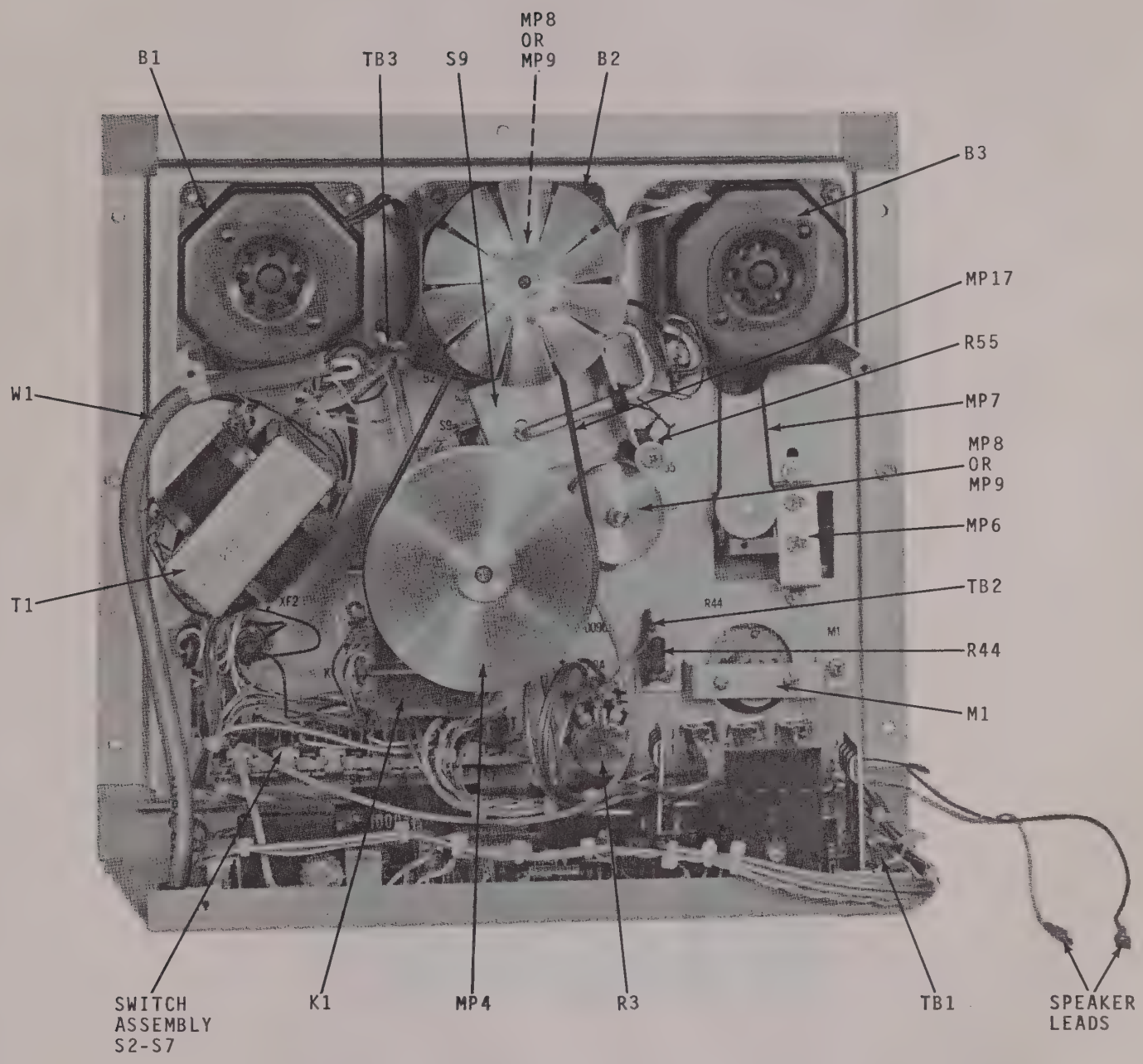


Figure 5-4. Recorder-Reproducer, Bottom View, Parts Location

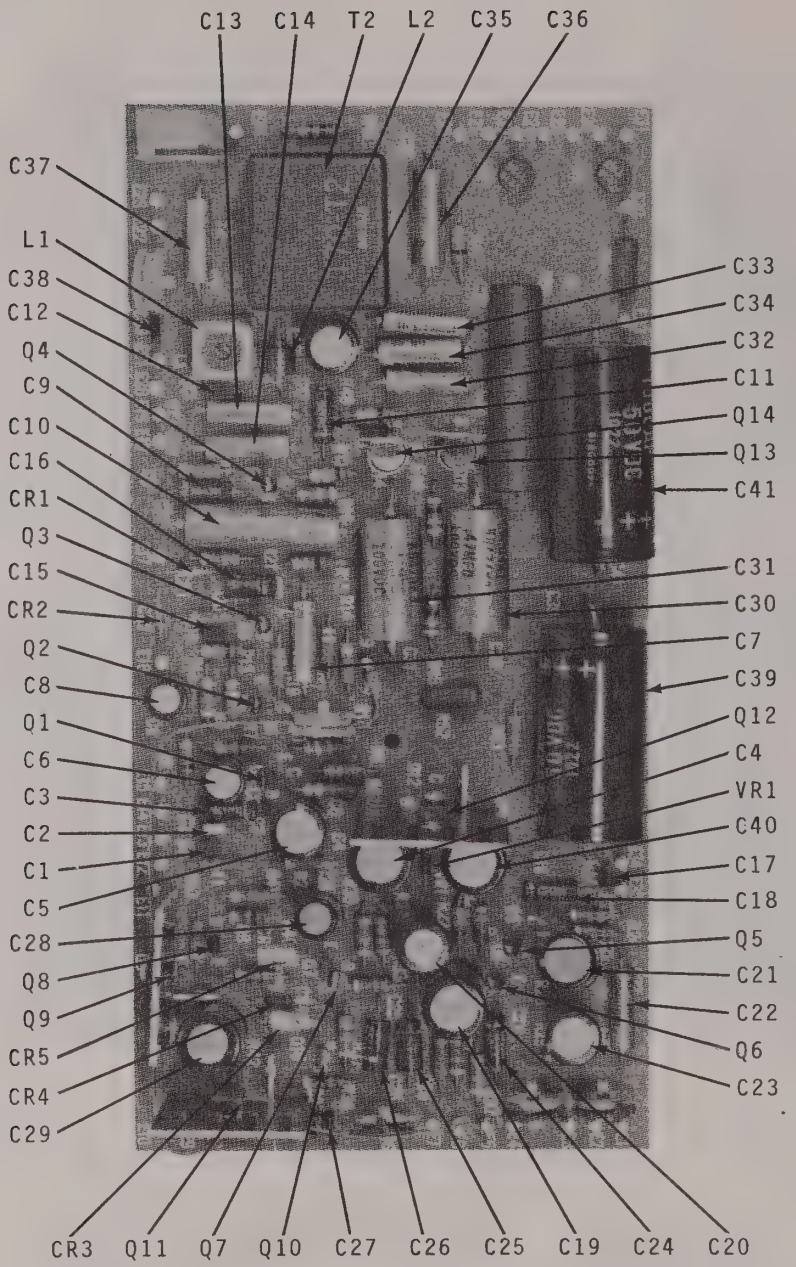


Figure 5-5. Terminal Board Assembly, Parts Location (Sheet 1 of 2)

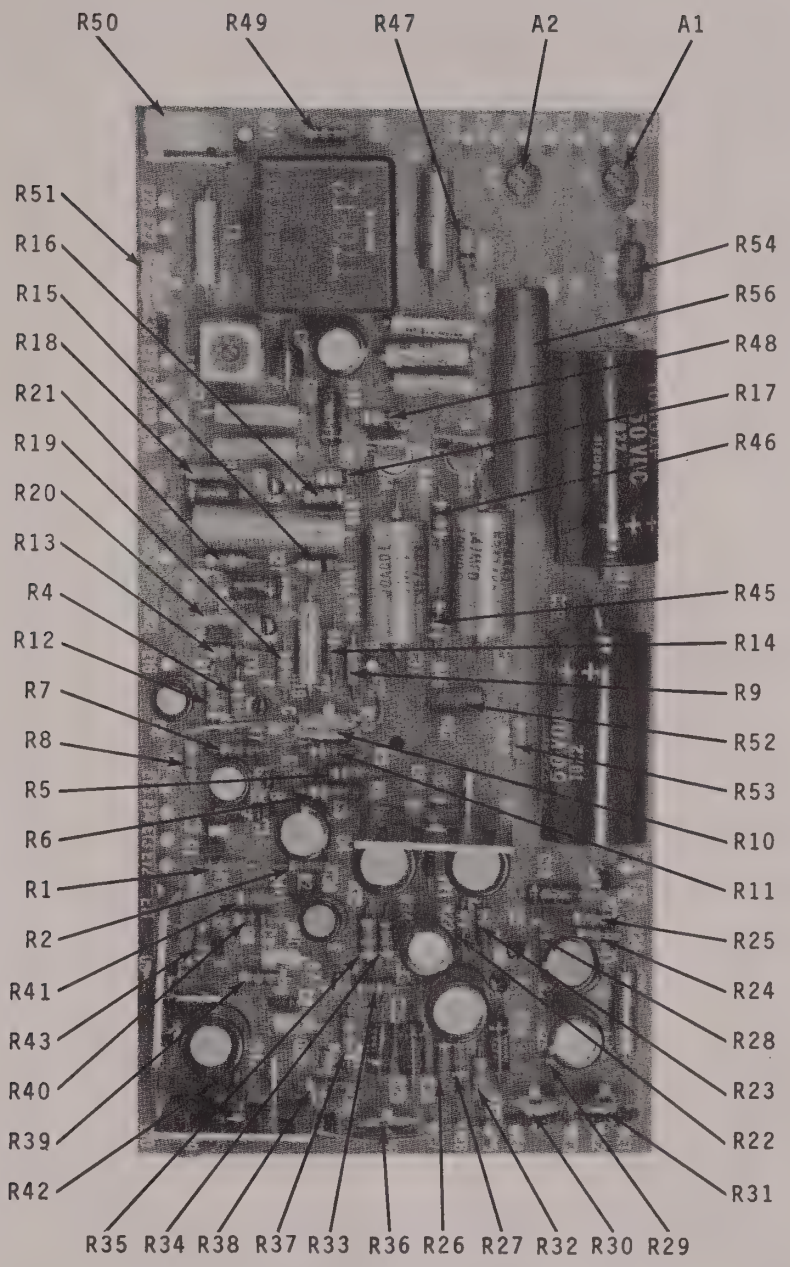


Figure 5-5. Terminal Board Assembly, Parts Location (Sheet 2 of 2)

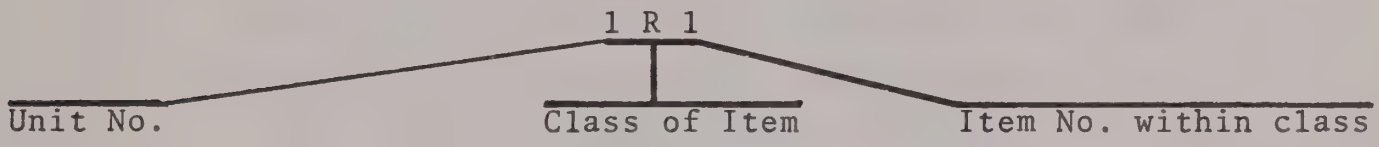
SECTION 6

PARTS LIST

6-1. INTRODUCTION.

a. REFERENCE DESIGNATIONS. -- The unit numbering method of assigning reference designations has been used to identify assemblies and detail parts. This method has been expanded as much as necessary to adequately cover the various degrees of subdivision of the equipment. An example of the unit numbering method is illustrated by the following:

Example 1:



Read as: First (1) resistor (R) of first unit (1).

Sockets associated with a particular plug-in device such as a lamp or a fuse, are identified by a reference designation which includes the reference designation of the plug-in device. For example, the socket for lamp 1DS1 is designated 1XDS1.

b. REFERENCE DESIGNATION ABBREVIATION. -- The reference designations of detail parts are abbreviated in the equipment and on illustrations. The abbreviated reference designations consist of a class letter (s) and the identifying item number. The complete reference designation may be obtained by placing the unit reference designation before the abbreviated reference designation.

6-2. MAINTENANCE PARTS LIST.

Table 6-1 lists the maintenance parts. Column 1 lists the reference designation of each part. Column 2 is not applicable and therefore is left blank. Column 3 gives the name and describes the various

parts. Complete information is given for all key parts (parts differing from any part previously listed within the same assembly). Parts identical with a key part are referenced to the key part for name and description data. Column 4 indicates the figure number of the pictorial illustration on which the part is identified. Stock numbers of parts used in this equipment may be obtained by referring to the Allowance Parts List (APL) published by the Electronics Supply Office (ESO).

6-3. LIST OF MANUFACTURERS.

Table 6-2 lists manufacturers of parts used in the equipment. The first column includes the manufacturers code number used in Table 6-1 to identify manufacturers. The second and third columns list the manufacturer's name and address respectively.

TABLE 6-1. MAINTENANCE PARTS LIST
SOUND RECORDER-REPRODUCER RD-365/UN

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1		SOUND RECORDER-REPRODUCER: mfr 25803, part no. 400-0001	1-1
A1		RECTIFIER, BRIDGE, ASSEMBLY: mfr 83003, part no. VE18	5-5
A2		Same as A1	5-5
A3		MICROPHONE ASSEMBLY: mfr 74384, part no. A2800	1-1
B1		MOTOR: fast forward: mfr 25803, part no. 228-0002	5-4
B3		MOTOR: fast rewind: mfr 25803, part no. 228-0003	5-4
B2		MOTOR: capstan drive: mfr 25803, part no. 228-0001	5-4
CR1		SEMICONDUCTOR DEVICE, DIODE: mfr 03877, part no. 1N34A	5-5
CR2		Same as CR1	5-5
CR3		SEMICONDUCTOR DEVICE, DIODE: MIL type 1N3253	5-5
CR4		SEMICONDUCTOR DEVICE, DIODE: MIL type 1N645	5-5
CR5		Same as CR3	
C1		CAPACITOR, FIXED, CERAMIC DIELECTRIC: MIL type CK05BX331M	5-5
C2		CAPACITOR, FIXED CERAMIC DIELECTRIC: MIL type CK05BX102M	5-5
C3		CAPACITOR, FIXED ELECTROLYTIC: 1 uf -0, +150%, 50 vdcw; mfr 24138, part no. TAW150	5-5
C4		CAPACITOR, FIXED ELECTROLYTIC: 220 uf -0, +70%, 35 vdcw; mfr 24138, part no. PCW220GK35	5-5
C5		CAPACITOR, FIXED ELECTROLYTIC: 200 uf -0, +100% 15 vdcw; mfr 24138, part no. PCW200GF15	5-5
C6		CAPACITOR, FIXED ELECTROLYTIC: 100 uf -0, +90%, 10 vdcw; mfr 24138, part no. PCW100GD10	5-5
C7		CAPACITOR, FIXED PAPER DIELECTRIC: MIL type CP04A1KF222K3	5-5
C8		Same as C6	5-5
C9		Same as C3	5-5
C10		CAPACITOR, FIXED, PAPER DIELECTRIC: MIL type CP04A1KB334K3	5-5
C11		Same as C3	5-5
C12		Same as C1	5-5
C13		CAPACITOR, FIXED, PAPER DIELECTRIC: MIL type CP04A1KF682K3	5-5
C14		CAPACITOR, FIXED, PAPER DIELECTRIC: MIL type CP04A1KE103K3	5-5
C15		CAPACITOR, FIXED, CERAMIC DIELECTRIC: MIL type CK05BX471M	5-5
C16		CAPACITOR, FIXED ELECTROLYTIC: 10 uf, -0, +100%, 15 vdcw; mfr 24138, TAW1015	5-5
C17		Same as C15	5-5
C18		Same as C3	5-5
C19		Same as C5	5-5
C20		Same as C4	5-5
C21		Same as C5	5-5
C22		CAPACITOR, FIXED, PAPER DIELECTRIC: MIL type CP04A1KF332K3	5-5

TABLE 6-1. MAINTENANCE PARTS LIST (Cont)
SOUND RECORDER-REPRODUCER RD-365/UN

REF DESIG	NOTES	NAMES AND DESCRIPTION	FIG. NO.
		SOUND RECORDER-REPRODUCER 1 (Cont)	
C23		Same as C5	5-5
C24		Same as C3	5-5
C25		Same as C16	5-5
C26		CAPACITOR, FIXED, ELECTROLYTIC: 25 uf, -0, +100%, 10 vdcw; mfr 24138, part no. TAW2510	5-5
C27		Same as C16	5-5
C28		Same as C6	5-5
C29		Same as C4	5-5
C30		CAPACITOR, FIXED, PAPER DIELECTRIC: MIL type CP04A1KB474K3	5-5
C31		Same as C30	5-5
C32		Same as C14	5-5
C33		CAPACITOR, FIXED, PAPER DIELECTRIC: MIL type CP04A1KE472K3	5-5
C34		Same as C33	5-5
C35		CAPACITOR, FIXED, ELECTROLYTIC: 50 uf, -0, +70%, 35 vdcw; mfr 24138, part no. PCW50GF35	5-5
C36		CAPACITOR, FIXED, PAPER DIELECTRIC: MIL type CP04A1KC473K3	5-5
C37		Same as C14	5-5
C38		Same as C15	5-5
C39		CAPACITOR, FIXED, ELECTROLYTIC: 1000 uf -0, +100%, 50 vdcw; mfr 24138, part no. TAW100050	5-5
C40		Same as C4	5-5
C41		Same as C39	5-5
DS1		LAMP, INCANDESCENT: MIL type MS25237-327	5-3
F1		FUSE, 1.5A, 250V: MIL type F03A250V1.5A	5-3
F2		Same as F1	5-3
J1		CONNECTOR, RECEPTACLE, ELECTRICAL: mfr 82389, part no. MT332A	5-3
J2		CONNECTOR, RECEPTACLE, ELECTRICAL: mfr 82389, part no. MT331	5-3
J3		Same as J1	5-4
K1		RELAY, SOLENOID: mfr 25803, part no. 219-0001	5-4
LS1		SPEAKER, PERMANENT MAGNET: mfr 25803, part no. 202-0001	
L1		COIL, RF, VARIABLE: 8-20 mh; mfr 76493, part no. 9061	5-5
L2		COIL, AUDIO: 10 mh; mfr 76493, part no. 70F102A1	5-5
MP1		CATCH, CLAMPING: mfr 25803, part no. 102-0002	
MP2		HINGE, BUTT: mfr 25803, part no. 102-0009	
MP3		BUMPER, RUBBER: mfr 25803, part no. 102-0004	
MP4		CAPSTAN DRIVE ASSEMBLY: mfr 25803, part no. 104-0003	5-4
MP5		SPRING, HELICAL EXTENSION: mfr 25803, part no. 102-0018	
MP6		COUNTER, TAPE: mfr BBBBB, part no. 4326-966-992-T004	5-3
MP7		BELT: mfr 72653, part no. 1410-63	5-4
MP8		PULLEY, 60 CYCLE: mfr 25803, part no. 101-0095	5-4

TABLE 6-1. MAINTENANCE PARTS LIST (Cont)
SOUND RECORDER-REPRODUCER RD-365/UN

REF DESIG	NOTES	NAMES AND DESCRIPTION	FIG. NO.
		SOUND RECORDER-REPRODUCER 1 (Cont)	
MP9		PULLEY, 50 CYCLE: mfr 25803, part no. 101-0094	5-4
MP10		SPRING, HELICAL EXTENSION: mfr 25803, part no. 102-0017	
MP11		SPRING, HELICAL EXTENSION: mfr 25803, part no. 102-0023	
MP12		PRESSURE ROLLER: mfr 25803, part no. 102-0024	3-1
MP13		KNOB, CONTROL: mfr 72512, part no. 2720Q	3-1
MP14		KNOB, CONTROL: MIL type MS91528	3-1
MP15		KNOB, CONCENTRIC CONTROL: mfr 25803, part no. 102-0011	3-1
MP16		HUB, REEL: mfr 25803, part no. 102-0021	5-3
MP17		BELT, mfr 72653, part no. 1499-31	5-4
MP18		SPRING, HELICAL COMPRESSION: mfr 11983, part no. P148A013	
MP19		POST, GUIDE: mfr 11983, part no. P173B013	
MP20		TAPE, SOUND RECORDING: MIL type TAT1200AF250NA	1-1
MP21		REEL, TAPE: MIL type ER250NA	1-1
M1		METER, VOLUME UNITS: mfr 38315, part no. 81T-20504003-025	3-1
PU1		HEAD, SOUND: mfr 11983, part no. EIHC44K-NO	5-3
Q1		TRANSISTOR: mfr 03508, part no. 2N2925	5-5
Q2		Same as Q1	5-5
Q3		TRANSISTOR: mfr 03508, part no. 2N2712	5-5
Q4		Same as Q3	5-5
Q5		Same as Q1	5-5
Q6		Same as Q1	5-5
Q7		TRANSISTOR: mfr 04713, part no. 2N4401	5-5
Q8		TRANSISTOR: mfr 04713, part no. 2N4402	5-5
Q9		TRANSISTOR: mfr 04713, part no. 2N4919	5-5
Q10		TRANSISTOR: mfr 04713, part no. 2N4400	5-5
Q11		TRANSISTOR: mfr 04713, part no. 2N4922	5-5
Q12		Same as Q11	5-5
Q13		TRANSISTOR: mfr 07910, part no. 2N3053	5-5
Q14		Same as Q13	5-5
R1		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF223K	5-5
R2		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF222K	5-5
R3		RESISTOR, VARIABLE, COMPOSITION, DUAL: 500K, 100K +10%; mfr 25803, part no. 213-0001	5-4
R4		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF684K	5-5
R5		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF153K	5-5
R6		Same as R5	5-5
R7		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF101K	5-5
R8		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF102K	5-5
R9		Same as R2	5-5
R10		RESISTOR, VARIABLE, COMPOSITION: 10K ohms ±10%, 1/4 watts; mfr 25803, part no. 210-0001-2	5-5
R11		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF274K	5-5
R12		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF472K	5-5
R13		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF103K	5-5

TABLE 6-1. MAINTENANCE PARTS LIST (Cont)
SOUND RECORDER-REPRODUCER RD-365/UN

REF DESIG	NOTES	NAMES AND DESCRIPTION	FIG. NO.
		SOUND RECORDER-REPRODUCER 1 (Cont)	
R14		Same as R1	5-5
R15		Same as R13	5-5
R16		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF475K	5-5
R17		Same as R13	5-5
R18		Same as R2	5-5
R19		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF683K	5-5
R20		Same as R2	5-5
R21		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF332K	5-4
R22		Same as R13	5-5
R23		Same as R1	5-5
R24		Same as R8	5-5
R25		Same as R7	5-5
R26		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF682K	5-5
R27		Same as R12	5-5
R28		Same as R4	5-5
R29		Same as R21	5-5
R30		RESISTOR, VARIABLE, COMPOSITION: 50K ohms ±10%, 1/4 watts; mfr 25803, part no. 210-0001-1	5-5
R31		Same as R30	5-5
R32		Same as R12	5-5
R33		Same as R21	5-5
R34		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF473K	5-5
R35		Same as R12	5-5
R36		Same as R30	5-5
R37		Same as R12	5-5
R38		Same as R8	5-5
R39		Same as R7	5-5
R40		Same as R7	5-5
R41		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF561K	5-5
R42		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF471K	5-5
R43		Same as R42	5-5
R44		RESISTOR, FIXED, WIREWOUND: MIL type RW69V8R00	5-4
R45		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF330K	5-5
R46		Same as R45	5-5
R47		Same as R13	5-5
R48		Same as R13	5-5
R49		RESISTOR, FIXED, COMPOSITION: MIL type RC20GF100K	5-5
R50		RESISTOR, VARIABLE, COMPOSITION: 250 ohms ±10%, 1.5 watts; mfr 25803, part no. 210-0002	5-5
R51		RESISTOR, VARIABLE, COMPOSITION: 100K ohms ±10%, 1/4 watt; mfr 25803, part no. 210-0001-3	5-5
R52		RESISTOR, FIXED, WIREWOUND: MIL type RW69V2R0C	5-5
R53		Same as R2	
R54		RESISTOR, FIXED, WIREWOUND: MIL type RW69V500C	5-5
R55		RESISTOR, FIXED, WIREWOUND: MIL type RW32V500	5-4
R56		RESISTOR, FIXED, WIREWOUND: MIL type RW56V820	5-5
S1		SWITCH, SLIDE: mfr 78488, part no. SS50	5-3
S2 thru S7		SWITCH ASSEMBLY, 7-SECTION: mfr 25803, part no. 240-0002	3-1

TABLE 6-1. MAINTENANCE PARTS LIST (Cont)
SOUND RECORDER-REPRODUCER RD-365/UN

REF DESIG	NOTES	NAMES AND DESCRIPTION	FIG. NO.
		SOUND RECORDER-REPRODUCER 1 (Cont)	
S8		SWITCH, BLADE: mfr 01693 part no. S37-82E	5-3
S9		Same as S1	5-3
T1		TRANSFORMER, POWER: mfr 25803, part no. 225-0005	5-4
T2		TRANSFORMER, RADIO FREQUENCY: mfr 25803, part no. 223-0001	5-5
VR1		SEMICONDUCTOR DEVICE, DIODE, BREAKDOWN: mfr 07263, part no. 1N972B	5-5
W1		CABLE ASSEMBLY, POWER: mfr 28105 part no. 9624-SJT	5-4
XDS1		LAMPHOLDER: mfr 72765, part no. LH73/1 with LC12WT2 lens	5-3
XF1		FUSEHOLDER: mfr 71400, part no. HKP	5-3
XF2		Same as XF1	5-3
TB1		BOARD, PRINTED CIRCUIT, TERMINAL: mfr 25803, part no. 104-0002	5-4
TB2		STRIP, TERMINAL, INSULATING: mfr 71785, part no. 332-14-03-013	5-4
TB3		STRIP, TERMINAL, INSULATING: mfr 71785, part no. 332-14-05-034	5-4

TABLE 6-2
CROSS INDEX, VENDOR PART NUMBER
TO REN DRAWING NUMBER

REF DESIG	VENDOR PART NUMBER	VENDOR FSCM	REN DRAWING NUMBER
A1	VE18	83003	232-0001
A3	A2800	74384	203-0001
B1	40915-10	73793	228-0002
B2	40910-18	73793	228-0001
B3	40915-09	73793	228-0003
C3	TAW150	24138	212-0002-1
C4	PCW220GK35	24138	212-0003-7
C5	PCW200GF15	24138	212-0003-6
C6	PCW100GD10	24138	212-0003-4
C16	TAW1015	24138	212-0002-2
C26	TAW2510	24138	212-0002-3
C35	PCW50GF35	24138	212-0003-3
C39	TAW100050	24138	212-0002-4
J1	JJ-024	81349	MIL-J-641/2
J2	JJ-086	81349	MIL-J-641/2
K1	A420-06345-0-0	73949	219-0001
LS1	R3AM-60	80248	202-0001
L1	9061	76493	218-0002
L2	70F10ZA1	76493	218-0001
MP6	4326-966-992-T004	***None	255-0002
MP7	1410-63	72653	102-0029
MP17	1499-31	72653	102-0028
M1	81T-20504003-025	38315	255-0001
PU1	EIHC44K-NO	11983	204-0001
R3	TYPE 5	78488	213-0001
R10	TYPE 20C	78488	210-0001-2
R30	TYPE 20C	78488	210-0001-1
R50	BE04250	71450	210-0002
R51	20C	29604	210-0001-3
S1	SS50	78488	209-0001
S2-S7	2625-1	**None	240-0002
S-8	S37-82E	01693	240-0004
T1	AS-90765	*None	225-0005
T2	T70-T2	11983	223-0001
W1	9624-SJT	28105	None
XDS1	LH73/1-LC12WT2	81349	MIL-L-3661/5
XF1	HKP	71400	None

* Albergo Transformer Company
Chicago, Illinois

** Seacor Inc.
Norwood, New Jersey

*** ENM Company
Chicago, Illinois

TABLE 6.3. LIST OF MANUFACTURERS

MFR CODE	NAME	ADDRESS
28105	Dearborn Wire & Cable Co.	Chicago, Illinois
BBBBB	ENM Counters	Chicago, Illinois
01693	K-Tronics Co.	El Segundo, California
02735	RCA Semiconductor and Materials Div. of Radio Corporation of America	Somerville, New Jersey
03508	Semi-Conductor Products Dept. GECO	Syracuse, New York
03877	Transitron Electronic Corp.	Wakefield, Massachusetts
04713	Motorola, Inc. Semiconductor Products Div.	Phoenix, Arizona
07263	Fairchild Camera and Instrument Corp., Semiconductor Div.	Mountain View, California
07910	Continental Device Corp.	Hawthorne, California
11983	Nortronics Co., Inc.	Minneapolis, Minnesota
14936	General Instrument Corp., Semi-Conductor Product Group., Semi-Conductor Division	Hicksville, Long Island, New York
24138	International Electronics Corp.	Melville, L.I., New York
25803	Ren Industries, Inc.	Chicago, Illinois
38315	Honeywell, Inc. Precision Meter Div.	Manchester, New Hampshire
71400	Bussman Mfg. Div. of McGraw-Edison	St. Louis, Missouri
71744	Chicago Miniature Lamp Works	Chicago, Illinois
71785	Cinch Mfg. Co., and Howard B. Jones Div.	Chicago, Illinois
72512	Davies, Harry Molding Co.	Chicago, Illinois
72653	GC Electronics Mfg. Co.	Rockford, Illinois
72765	Drake Mfg. Co.	Chicago, Illinois
73793	General Industries Co., The	Elyria, Ohio
74384	Turner Co.	Cedar Rapids, Iowa
76493	J. W. Miller Co.	Los Angeles, California

TABLE 6.3. LIST OF MANUFACTURERS (Cont)

MFR CODE	NAME	ADDRESS
76545	Mueller Electric Co.	Cleveland, Ohio
78488	Stackpole Carbon Co.	St. Marys, Pennsylvania
78553	Tinnerman Products, Inc.	Cleveland, Ohio
80248	Oxford Electric Corp.	Chicago, Illinois
82389	Switchcraft, Inc.	Chicago, Illinois
83003	Varo, Inc.	Garland, Texas
91833	Keystone Electronics Corp.	New York, New York

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